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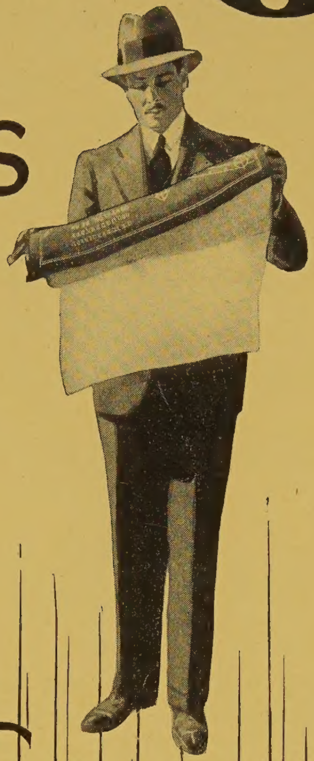

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The Cement Mill Edition of Concrete is edited exclusively for those interested in the manufacture of cement. Its pages are devoted to discussions of plant design, management, operation, production efficiency, chemical research and control, quarry operation, progress and news of the industry.

The Cement Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition. The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

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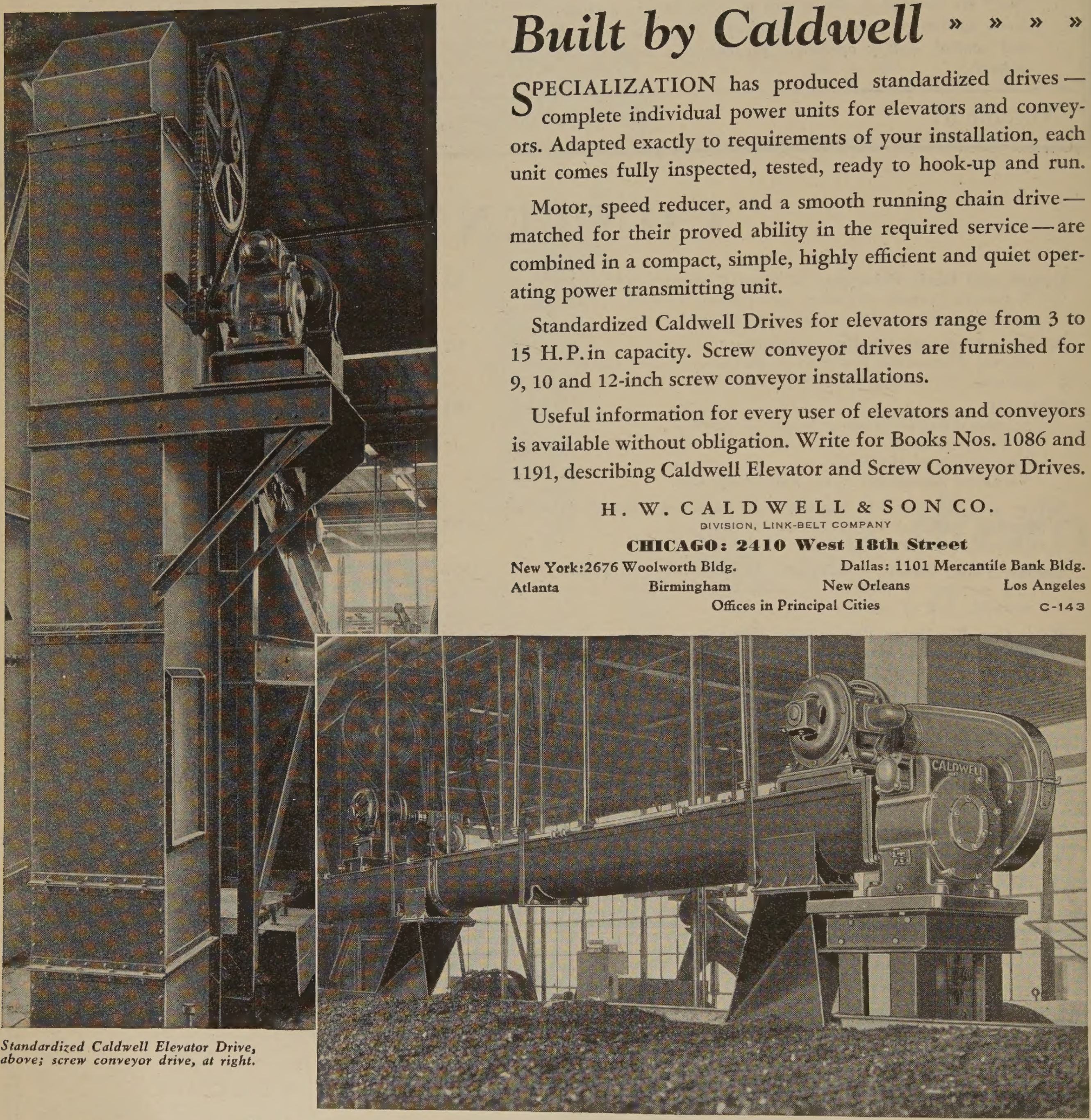

Standardized Caldwell Elevator Drive, above; screw conveyor drive, at right.

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MILL SECTION of
Concrete
Vol. 37 Chicago, July, 1930 No. 1

Details and Basic Principles of Dust Collection

An Important Element in Modern Plant Efficiency—Recovered Dust Has Definite Money Value—Damage to Machinery Eliminated—Operating Mechanism of Well-Known Dust Collecting System Described—Little Power Required—Purified Air Heats Buildings

By S. GEORGE FREMONT
Consulting Engineer, Berlin, Germany

IT is now generally recognized that dust collection goes hand in hand with efficiency of practically every branch of industry. It should be employed during the process of manufacture wherever fine dust is developed, not only to safeguard the health of the workers, but also to remove the hazard of fire and explosion as well as to protect valuable machinery and to prevent nuisance and damage to surrounding property.

Dust Has Definite Value

Very often the recovered dust is extremely valuable, a fact that has direct application in the cement industry, where collected stone dust is returned to the kilns and cement dust is delivered to the cement storage bins. In many cases also the output of the equipment can be greatly increased by intensive ventilation and dust collection. Coarse and heavy dust is easily collected by cyclones and similar means, but for fine and light dust textile fabrics must be employed.

For small capacities a few bags or balloons are well enough, but beyond that the so-called "static bag filters" are most unsatisfactory. To obtain even a reasonable efficiency and life the fabric must be closely woven and strong, and fabrics of this kind will neither clean themselves, nor can they be freed from the clinging dust by hand beating.

Considerable progress in the development of dust collection equipment has been made by the Maschinenfabrik Beth in Lübeck, Germany, which for 50 years has been engaged in the manufacture of this special equipment. This equipment has been installed for the collection of almost every kind of material in powder form, i. e., flour, coal, cement, lime, flue ashes, sugar, soap, milk powder, sulphur, ores, enamels, chemicals, metallic dust, and fumes such as tin and zinc oxides and a host of others.

Basic Principles in Design of Equipment

With the Beth dust collector the dust-laden air or gas is drawn by a suitable exhauster through a number of cloth tubes, arranged in compartments, which retain the dust while the cleaned air is discharged to the atmosphere or directly into the building. The dust is periodically and automatically shaken off and at the same time blown off the filter tubes by a mechanical shaking gear and separate positive supply of clean scavenging air. This combination keeps the filter efficiency constant and prevents choking of the tubes and consequently a breaking down of the plant, the more as the quantity and pressure of the scavenging air can be suited to the specific nature of the dust.

Where the gases are highly charged with moisture, the scavenging air is at the same time preheated to prevent condensation in the casing and a moistening of the tubes. Internally the dust collector is arranged so that each compartment during the cleaning process will be isolated from the other compartments in operation, which therefore cannot be overloaded. These means automatically insure intensive cleaning and conserving of the filtering material at the same time preserving a maximum capacity.

Outstanding Features

1. The system is automatic, and beyond occasional lubrication of bearings it requires no attention.
2. A separate and positive supply of scavenging air effectively cleans and preserves the filter tubes.
3. The filter units are independent in operation and cannot be overloaded by the scavenging air and dust from the compartments being cleaned.
4. The filter efficiency will not be affected by moisture and the dust is collected in dry condition.
5. The efficiency is nearly 100 per cent.

Operating Mechanism

The operating mechanism is illustrated in the line drawing, which shows the suction type dust collector with 45 filter tubes, grouped into three units, I, II, III, each consisting of 15 tubes. The groups or chambers are separated by partitions "c" and are provided below the tube

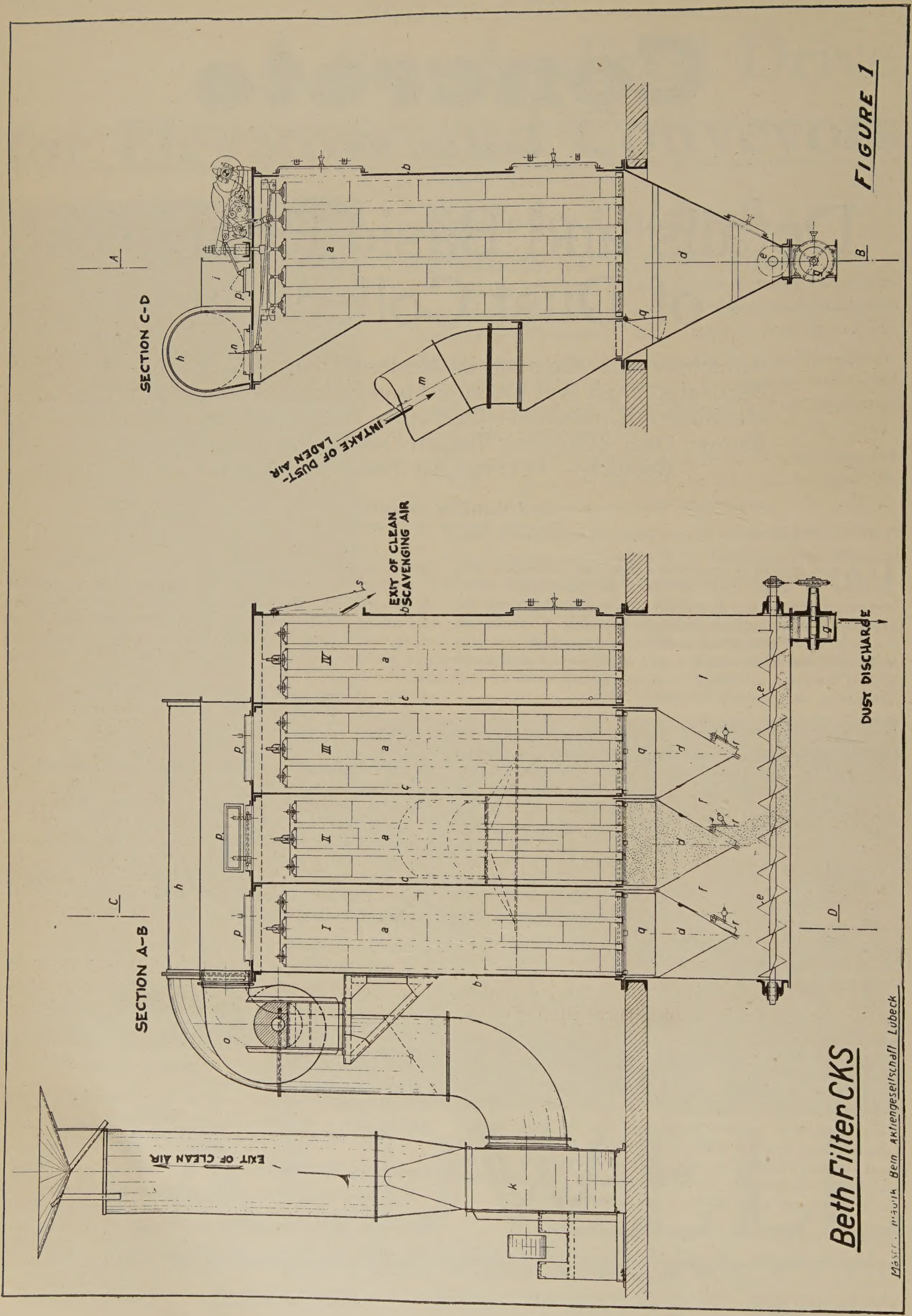
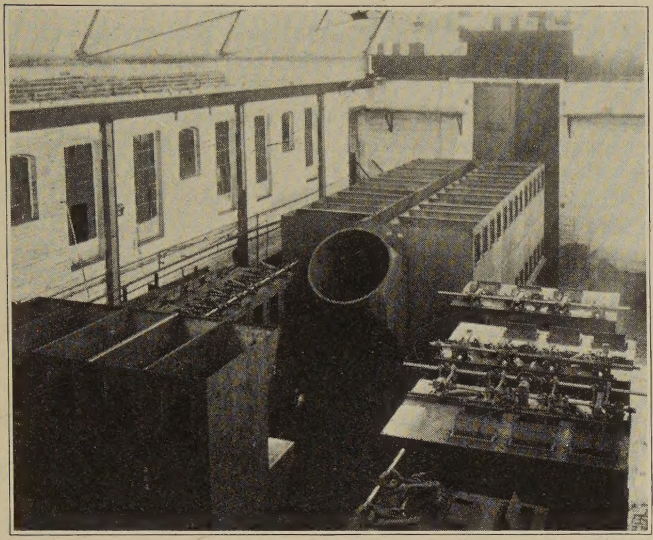

SECTION C-D
SECTION A-B
INTAKE OF DUST-LADEN AIR
EXIT OF CLEAN SCAVENGING AIR
DUST DISCHARGE
EXIT OF CLEAN AIR
A
B
C
D
a
b
c
d
e
g
h
i
k
l
m
n
o
p
q
r
s
I
II
III
IV
Beth Filter CKS
Maschinenfabrik Beth Aktiengesellschaft Lubeck

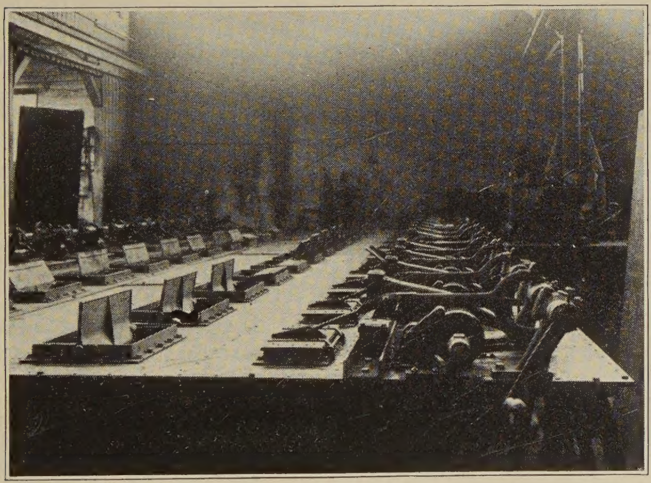
FIGURE 1

plates with separate collecting hoppers "d," which empty into channel "f." The latter contains a horizontal spiral conveyor "e" and is made dust-tight against the outer atmosphere, and is also provided with a rotary dust gate "g." Chamber IV contains the filter tubes for the scavenging air. On top of the filter casing is placed the gear for closing and opening the air gates and for shaking the filter tubes as well as header "h" for collecting the cleaned air and header "i" for distributing the scavenging air.



Beth filter in course of construction, consisting of 26 chambers

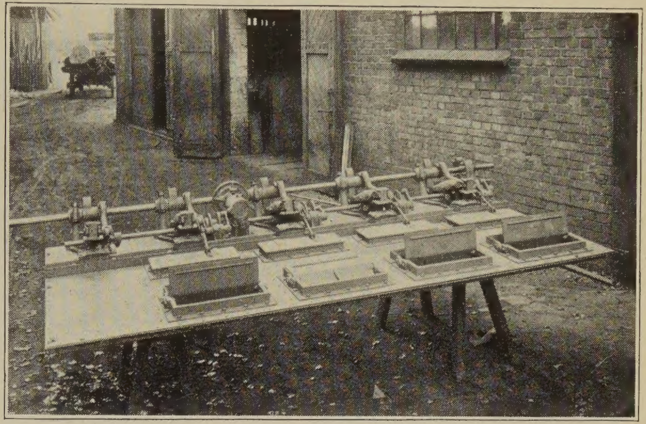
Under the suction created by exhauster "k" the dust-laden air enters through intake "m" and balanced non-return shutter "q" into hopper "d" below the tube plate, where all heavy dust is deposited, and then passes into the inside of tubes "a." These tubes are of heavy cloth, a texture to suit the nature of the dust to be dealt with. The dust is deposited on the inner surface, while the clean air leaves through gates "n" and header "h," and is discharged, actuated by exhauster "k," into the atmosphere.



Showing top of filter with the automatic shaking device

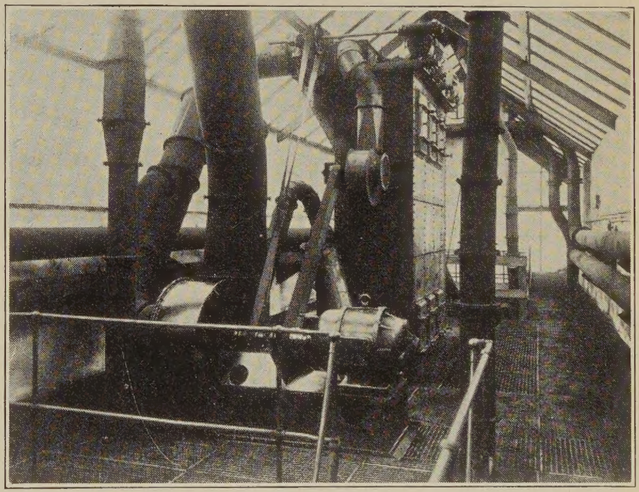
The scavenging air moves in the opposite direction and is delivered to the dust collector by a separate fan "o" through the intake header "i" and shutters "p" into chambers I, II and III. By passing from the outside to the inside of the tubes, the latter are freed from the deposited dust which is carried by the air stream into hopper "d," and from there through balanced shutters "r" into the conveyor channel "f." The dust leaves by outlet "g" and the scavenging air through the auxiliary filter IV, which is cleaned by shaking only.

Gates "n," controlling the clean air suction, and shutters "p," controlling the admission of scavenging air, are opened and closed automatically by the top operating gear, while shutters "q," controlling the admission of dust-laden air, and shutters "r," controlling the exhaust of the scavenging air, are operated automatically by the difference in pressure between the dust-laden and scavenging air.



Showing standard top of filter for four chambers and one auxiliary chamber

The groups forming one filter are cleaned in rotation. Fig. 1 shows chambers I and III in operation, while chamber II is being cleaned. The interval between and the duration of the cleaning process depend on the nature and quantity of the air-borne dust and are adjusted accordingly. All valves open and close in due sequence, and the whole operation is entirely automatic without manual assistance. Where the scavenging air has to be heated, the air heater is either placed between the scavenging fan "o" and distributing header "i," or at the air intake of the fan.



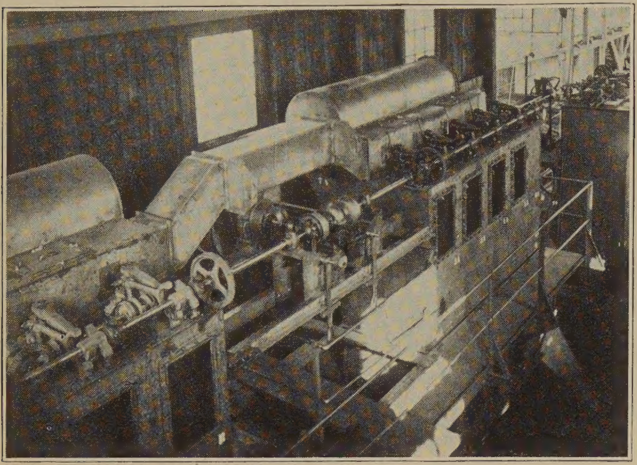
Beth filter in super-power station, Klingenberg, Berlin, showing both fans

Power Required

The power for driving the operating and shaking gear is practically negligible. As a rule the drive is effected from a pulley on the main or scavenging fan. These are usually separate units, but in some cases, especially with small plants, the two fans are joined and mounted on a common shaft.

The Casing

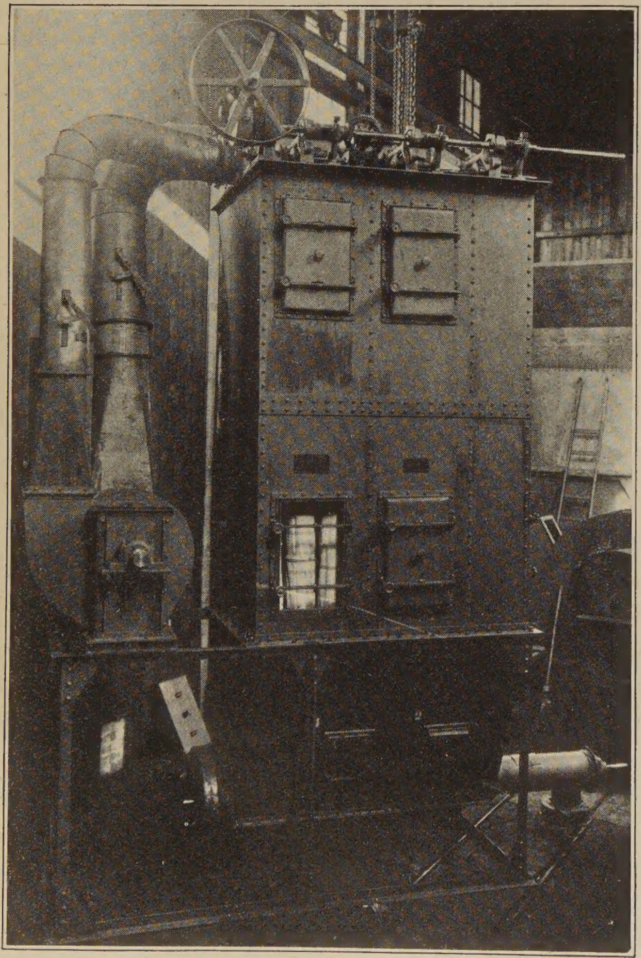
The casing of the dust collector is generally made of sheet iron, although in some cases, for instance, for flour or light chemicals, wood is preferred. Ample inspection doors permit inspection and exchange of tubes.



Double filter, showing top with operating gear

Duct System

Where dust is collected from a number of sources, the connections are usually made to a low velocity main, with the main suction to the dust collector at any convenient point.



Filter in course of construction, showing two fans. One inspection door is open

Various Applications

The employment of this system is almost universal, but is of especial advantage in some of the staple industries. The modern treatment of coal, both in the preparation for the market, at the colliery, and in the consumption at the power station, provides one of the most useful fields of application. In the cleaning and pulverizing of coal, large volumes of fine dust-laden air have to be handled and filtered before they can be allowed to return to the atmosphere. This is not only a necessity, but also an economy, as the collected dust is a ready material for powdered fuel firing.

One of the most modern super-power stations in Germany, the Klingenberg power station of the Berlin municipal electric company, has been equipped with 10 Beth plants of considerable magnitude. These deal with the exhaust gases from the coal dryers, the coal cooling plants, the Raymond pulverizers, and the coal pump exhaust from the fine coal bins. In all cases at least 99 per cent of the coal dust in suspension is recovered in dry condition and the surrounding atmosphere is being kept free from pollution.

The flue ash problem also finds a complete solution in this dust collector if perfect elimination is desired, provided that the gases can be cooled sufficiently so as not to injure the filter tubes. In blast furnaces the system is used extensively in the cleaning of the gases.

There is hardly another industry where dust is created in larger volume than in cement mills. With inefficient collection as much as 5 per cent of the total production in cement mills may be lost. The capacity of the mills can be greatly increased through intensive ventilation. In cement mills these collectors have for years been used in connection with coal drying and pulverizing, kiln exhaust, conveyors, and packing plants. In the crushing and pulverizing of stone and similar hard material, effective dust collection not only increases the output of the mills, but is also instrumental in producing a product of greater value, protecting at the same time the health of the workers.

Not the least advantage of this dust collector lies in the fact that the cleaned air can be discharged directly into the workshops, thereby aiding in maintaining working temperatures in the buildings.

Texas Cement Production Reports Favorable

Cement production in Texas is showing a continued upward curve of expansion, according to "The Texas Review," issued monthly by the bureau of business research at the University of Texas. Normally, output should increase about ½ per cent from March to April, whereas this year the gain between the two months was nearly 9 per cent. Production in the entire United States was 1.7 per cent under that in April, 1929. However, the shipments made the unusually large increase of 19 per cent in March. As a result, stocks were reduced slightly for the first time since June last year.

In April, Texas mills turned out 757,000 barrels, compared to 694,000 barrels in March and 622,000 barrels in April, 1929. Shipments increased from 627,000 barrels in March to 775,000 barrels in April and compare with loadings of 625,000 barrels in April, 1929. Stocks on May 1 were 825,000 barrels, a reduction of 20,000 barrels from last month, but nearly double the amount reported on May 1 a year ago.

Prices remained unchanged.

Securing Constant Quality in Cement

Importance of Constant Chemical Composition of Raw Mix—Dealing With Raw Materials of Varying Composition—Method of Feeding to Crusher—Proportioning and Mixing of Raw Materials—Improper Use of Raw Storage Silos

By MARCEL BERNASCONI

IN the previous installment we discussed the necessity for maintaining constant fineness in the raw mix, as one of the essentials of making cement of uniform quality. In this installment we take up the maintenance of constant chemical composition of the raw mix.

Constant Chemical Composition of the Raw Mix

Constant chemical composition depends on:

1. The nature of the primary materials.
2. Care taken in proportioning and conditions under which mixing of the primary materials takes place.
3. Homogeneity of the meal or of the paste after grinding.

1. *Nature of Primary Materials.* It is obvious that the most favorable conditions for constant chemical composition of the mix are constituted by constant composition of materials arriving from the quarry.

Unfortunately this can be realized only accidentally, as, for example, when a quarry is worked where limestone is encountered in a compact mass of identical composition running from left to right, from top to bottom, or back to front of the cut.

Yet alongside of these few fortunate plants, how many find themselves contented with working an infinite number of layers of varying composition, not only from layer to layer, but also, which is fortunately less frequent, from point to point of the same deposit? In the former case, the procedure is simple: large-scale blasting is done; the rock is picked up by the most economical method and is transported to the crushers without further worrying about its chemical composition, which is known to vary only within narrow limits. Check tests are made at more or less frequent intervals.

If, however, instead of dealing with one compact mass, one deals with several layers of considerable depth, it will be of advantage to exploit each layer separately, if this procedure appears reasonable.

When the quarry is composed of numerous layers of small depth, working by layers is entirely out of the question. If the layers retain the same composition throughout their length, we would advise dividing the quarry into sections and working the same number of layers in each section, having determined the average chemical composition for each such group.

Materials arriving from each of these layers or groups of layers should be kept separated. In certain plants they are separately conveyed to the crusher. We absolutely condemn this procedure, unless some exceptional local conditions render it impractical to do otherwise. It not only requires an adjustment of proportioning whenever one passes from one layer or group of layers to another, and thus introduces increased probability of error, but it also makes it impossible to maintain a constant silica modulus. We admit that when proportioning is based on a certain $CaCO_3$ content, the hydraulic index remains practically constant; yet there is no guarantee that the silica index will not vary within very wide limits. The important effect of this index on the properties of cement is well known.

We prefer to feed into the crusher simultaneously corresponding parts of materials arriving from each of the layers or groups of layers, kept separated up to this point. By corresponding parts we mean quantities proportional to the strength, the depth of the group of layers or individual layers.

The materials become sufficiently mixed during the subsequent operations of crushing, storage, conveying, grinding, etc. This results in that over the course of one year the chemical composition remains practically constant. To substantiate this statement by means of figures, we may state that, independent of the number of layers of limestone or marl in a quarry, and independent of the variations in chemical composition from layer to layer, the average samples tested at an interval of one hour at the crusher discharge should not reveal differences greater than from 2.0 to 2.5 per cent in $CaCO_3$ content. These limits were personally checked by the author in a number of plants, and the variations in $CaCO_3$ content were never found to exceed 2.5 per cent. Nor was this limit ever reached unless one considered crusher production (1) during dry weather, (2) during rainy weather. Everyone knows that during rainy weather all rock arriving from the quarry and particularly that picked up in small fragments by fork or shovel becomes more coated with dirt than in dry weather. The dirt tends to reduce the average $CaCO_3$ content of the material. As a rule, in fair weather, the variation in $CaCO_3$ content does not exceed 1.5 per cent. We assume that, with the exception of a few rare cases, it is always possible to arrive at this result by undertaking a careful study of the quarry, thorough cross-sectioning of the layers, a proper division of the latter into groups, and well supervised working of the material in accordance with a plan worked out in the laboratory, upon which the successful working of a quarry for raw materials primarily depends.

Returning to the subject of rendering homogeneous the raw materials, beginning at the quarry, we will say that one should:

1. Avoid sending to the crusher simultaneously too large quantities of materials coming from one layer or one group of layers.
2. Plan operations in such a way that in the shortest time possible the crusher receives the corresponding parts from each of the layers or groups of layers.

It is certainly much easier to proceed as is done in so many quarries, i. e., to send the rock to the crusher and the clay to the soaking pit as they come without being concerned about the section of the quarry from which they

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Translated from *Revue des Materiaux de Construction*, March, 1930.

are taken. We envy plant managers who can permit themselves such simplifying methods without endangering their product, and we urgently invite the others, who still constitute the majority, to follow our advice and example in assuring the former that the additional effort they would expend in the quarry would be a hundred times repaid by the advantages of rational quarrying, which leads to a material of constant chemical composition.

The foregoing is of interest particularly in connection with plants using the dry process, which do not have at their disposal the admirable homogeneity agent in the form of the slurry mixing tank. Yet the wet process plants have every reason to adopt the above procedure; it will automatically insure a constant silica index of the slurry, a result which is not necessarily achieved by proportioning based on $CaCO_3$ content. It will be easily seen that if the silica index is not constant in the raw mix, its correction made in the slurry simultaneously with that of the hydraulic index becomes such a complex problem that it can not be solved by any practical method. The most powerful factor of success in a plant is a simplification, which tends to diminish the causes of errors and the influence of the personal equation. In this connection we eagerly commend the reading of Mr. Hendrickx' remarkable work: "Special Notes on the Manufacture of Artificial Portland Cement," more particularly Chapter IV, which discusses the above matter.

2. *Proportioning and Mixing of the Raw Materials.* Is it necessary to state that the chemical composition of the raw mix will be the more constant, the greater the care used in proportioning the component materials? Time has seen the passing of such units of measurement of materials as the carload or the wheelbarrow, to say nothing of the shovelful. A plant which pretends to make use of up-to-date methods must proceed by weighing the materials, except in the case of the wet process, where the clay is measured by volume.

There are in existence weighing devices operated by one man which regulate the proportioning of raw materials for the manufacture of 1,000 tons a day or more under conditions of great precision and safety.

A question arises: When should the various raw materials entering into the mix be combined?

It is understood that this problem is solved in advance when the raw materials used by the plant are a hard limestone, which is not soluble, and a clay. The latter being separately prepared in a semi-liquid state, while the former is simply crushed, the mixing cannot take place except at the moment of feeding the materials into the mill. The correction of slurries being a simple and easy operation, as well as a mathematically accurate one, the proportioning of raw materials does not take the care that it requires in the dry process, and many of the precautions indispensable with the latter may be omitted with the former.

In plants operating by the wet process, i. e., making use of soluble materials entirely (such as chalk and clay), these can either be diluted together in the same tank, or reduced to a semi-liquid state in separate tanks. For these reasons, we admit that here also exists a considerable latitude in the selection of methods best adapted to local conditions. A correction of the slurry accomplishes the rest.

Conditions are quite different when dealing with the dry process. Correction of the raw mix is a long, costly and laborious operation, and it is extremely important to avoid it or, at least, to reduce it to a minimum. In an article entitled "Preparation of Raw Mixes by the Dry Process," No. 220, *Revue des Materiaux de Construction*, January, 1928, Marc Elber discusses the problem of homogeneization of meals in a manner so complete that we do not hesitate to refer our readers to it.

It is evident that the only method of avoiding correction of the raw mix is an arrangement through which the mix on leaving the mill requires no correction; i. e., it maintains a composition in the close neighborhood of that required by the manufacturing demands. To arrive at this, the mix, before entering the mill, should never vary appreciably from a fixed composition.

We have seen the importance of assuring correct proportioning by means of exact weighings. Yet we have not answered our own question as to when the different components of the mix should be combined.

Should it be before drying? No, if possible to avoid it. The moisture, varying considerably in the materials, will confuse the weights without possible correction of errors, due to the great variation in moisture content of materials, to exposure to weather conditions, the relative location of the material in the heap, and the presence of fines, which absorb relatively more water than the coarser particles.

It is thus upon drying that mixing should follow. Drying, therefore, goes on separately in two distinct dryers, or by alternately making use of the same dryer for both materials. In any case they will remain separate upon leaving the dryer.

We are tempted to make an exception in the case where the materials are always used in a dry state, such as, for example in a plant visited by the author, where the different limestones were quarried by tunneling and emerged only to enter the crusher, thus never being exposed to rain. Another case is where the nature of the materials is such that they retain only negligible quantities of moisture, as do certain limestones. We are tempted in such a case to permit simultaneous drying of raw materials upon mixing, yet must insist on the following reservations:

Most designers of machinery provide a storage silo between the dryer and the mill to equalize production and to provide for possible shutdowns of the crusher, the dryer or any other part of the primary crushing plant. The principle is excellent and cannot be argued against. Yet when the silo receives a mix composed of several materials in fragments differing in size, shape and weight, separation takes place and the carefully established homogeneity is destroyed.

In fact, the mix transported by any kind of a conveyor drops into the silo forming a cone which rises as the silo is filled. Everybody has had a chance to observe how the coarsest, heaviest and more rounded particles roll down the sides of the cone and settle around its base. A regular separation is produced: at the apex are settled the ducts and fine particles, the size of particle increasing gradually with the distance from the apex. When the silo is full, the fine particles are grouped around the center, while the coarse particles are settled around the circumference. When the silo is drawn, as is usually the case, at the bottom and in the center, a sort of funnel or chimney is produced in the center of the silo, as is observed daily. The fines are first to escape and it is only afterward that the peripheral sections will follow.

This fact would lead to no trouble if the fines had the same chemical composition as the coarse particle. Unfortunately, this is rarely the case. Two limestones, A and B, of different chemical composition, will show most of the time a different behavior in the crusher. Limestone A, with a higher $CaCO_3$ content than B, will yield more fines than B. It follows that in a mix $A + B$, the fines will be much richer in $CaCO_3$ than the particles escaping from the dust.

We consider it to the point to cite a few figures personally observed in a dry process plant, where the mix consisted of a limestone of 98 per cent $CaCO_3$, coarsely crushed, and of granulated blast furnace slag containing about 48 per cent CaO. The limestone arrives at the plant in large fragments and is stored under cover; it is, therefore, practically dry upon crushing, which is done under the same roof. The slag is dried and stored in a silo. The limestone storage silo is located side by side with the slag silo and an automatic scale is provided below for separate weighing of limestone and slag. The contents of the weighing hopper are then dumped on a single conveyor which transports the mix to two storage silos, each feeding a mill. One of the silos, A, of square cross section, has a capacity of about 150 tons; the other, B, of rectangular cross section, is larger (250 tons) and is loaded by means of two trap doors placed symmetrically at the top of the silo.

The following experiments were made on both silos. Upon filling both silos, no more material was admitted; the mills were put in operation and the material was drawn from an opening managed at the apex of the pyramid formed at the bottom of the silos. Every half hour an average sample of the meal leaving each mill was collected and its $CaCO_3$ content determined by means of a calcimeter.

The following table records the collected data. It may be added that the production of each mill was about 12 tons per hour.

A	B
56.10	57.60
54.80	58.80
——	59.10
44.20	59.00
42.50	58.10
——	57.10
40.20	57.60
40.10	58.40
——	59.60
40.80	58.10
40.50	56.00
——	57.80
41.40	59.30
46.30	62.40
——	57.10
50.70	59.10
56.90	57.40
——	53.20
58.10	51.70
58.10	47.50
——	46.50
58.30	47.10
59.10	46.30
——	47.80
61.00	47.70
63.50	45.10
——	44.10
68.00	46.80
68.60	50.30
——	55.40
69.10	57.00
70.60	59.10
——	60.30
68.60	68.90
71.40	66.90
——	67.00

In silo A the fines were assembled in the central portion, while the coarse particles had passed to the periphery. In the fines the slag predominated, while at the circumference limestone fragments were more numerous. This statement is confirmed by the fact that the first calcimeter determinations showed a relatively low $CaCO_3$ content, while it kept increasing gradually, as the silo became emptied and the peripheral content passed into the mill.

The sudden retrogressions are simply results of more or less pronounced slides inside of the silo.

The blank spaces in the A column have no other basis but to make up for the difference in time of discharge of the two silos, thus bringing the figures corresponding to the time of beginning and end of discharge opposite each other in the two columns. Things have taken a different course in silo B from that in A. The $CaCO_3$, first higher than in silo A, gradually decreased to a minimum, then again increased to approach the values obtained in silo A. This fact is easily explained by the existence of two charging trap doors. Two cones formed inside this silo; between these, at the center of the silo, became located a zone of coarse material, rich in lime. To the right and to the left of this zone are two nuclei corresponding to the vertices of the two cones and with slag as predominating material; finally around the walls of the silo are located two zones of coarse particles, rich in lime.

The $CaCO_3$ content does not drop down as low in silo B as it does in silo A, for, while the material around the vertices of the cones is being drawn, the coarse high-lime material from the central zone also escapes, tending to raise the $CaCO_3$ content of the whole.

It is observed that the discrepancies in composition are enormous, undoing all proportioning previous to grinding. Does it mean that the storage silos at the feed end of the mills should be eliminated? It is certain that they are an absolute necessity; yet there is no absolute necessity of placing them directly before the mill, of providing but one for each mill or of introducing into them a ready-mixed material. It would seem a ridiculous suggestion to try to specify a typical arrangement which would pretend to solve this "tandem" problem; we will limit ourselves to saying that one should try to keep the primary materials separate as long as possible up to the moment of proportioning, which should be done by weight, yet may be executed by any other method, and one should avoid introducing between the weighing mechanism and the mill a storage silo of too great dimensions. When this is done and all recommendations made in the foregoing are carefully realized, the mill will yield a raw mix of so nearly constant a composition as to render superfluous further homogeneization of the raw mix.

It is especially in the rotary kiln installations that the nature of the coal ash has a tremendous effect on the chemical composition of the clinker. In general, the coal used in the rotary kiln contains from 6 to 20 per cent ash. We will assume an average of 10 per cent. As the coal consumption is about 25 kg. per 100 kg. of clinker, it follows that the proportion of ash which mixes with the clinker is 2.5 per cent (5 per cent when coal with 20 per cent ash is used).

The chemical composition of coal ash may vary within very wide limits, for some varities of coal have an almost entirely siliceous ash, while others have an ash with as much as 50 per cent alumina and iron oxide. Considering the important effect of fluxing materials on calcination and on the properties of clinker, we realize the urgent need of adopting one type of fuel which will always remain the same, if clinker of constant composition is to be produced. This is another reason, in addition to that of economy, why the cement producer should deal directly with the mines, remembering to put in a clause guaranteeing the delivery of the same coal throughout.

Today, electric dust collecting has become routine practice in rotary kiln plants. The recovered dusts have a chemical composition differing considerably from that of the raw meal or of the clinker. They are generally very rich in SO_3 and contain a high proportion of elements found in the coal ash.

In certain plants, the dust upon being collected is directly returned to the kiln at regular intervals. This practice should be condemned in all cases, as a quantity of material of this kind, differing greatly from the raw material, can in view of its make-up and of the intermittent character of its addition, but upset the calcination, thus impairing its constant character.

Neither is it advisable to waste the collected dust under the pretext that it impairs the quality of the clinker. It, therefore, appears rational to incorporate the dusts by a continuous method either in the slurry tanks and in the raw mix silos, or directly into the kiln, the former method being generally the better.

3. *Homogeneization of the Slurry or Meal Upon Grinding.* In cases where considerable discrepancy in composition occurs upon grinding, there remains, as a last resort, the possibility of homogeneization of the paste in mixing tanks, or of the raw mix in silos.

The proportioning and correction of slurry has been masterfully described by Jean Hendrickx in his work referred to above.

In the same connection, we refer the reader to an article by Marc Elber: "Preparation of Cement Slurries," *Revue des Materiaux de Construction*, No. 217, p. 333, October, 1927.

Concerning the homogeneization of raw meal, we refer again to an article by the latter: "Preparation of the Raw Mix by the Dry Process," quoted above.

We have nothing to add on this subject.

When the cement producer will have realized the conditions which we have tried to expound here as clearly as possible; when he will have arrived at constant fineness of his primary materials; when he will have established an absolutely uniform chemical composition of his meal or slurry, this composition having been selected judiciously, there can be no argument against his labeling the bags of his product "portland cement." For under these conditions only can he arrive at that fundamental quality which is common to all cements, namely, constancy.

No argument can be advanced, as we have said. This assumes that the kiln operator knows enough about his job to add to constant fineness and constant chemical composition a uniform calcination, without which all efforts would be without avail.

This touches a subject which will be discussed at a later date.

How South Carolina Highway Cement Will Be Imported Duty-Free

A plan for evading duty on foreign cement imported by the state for use in highway construction will be carried through by South Carolina unless American manufacturers make very low bids, according to a news report.

The plan, disclosed in May by C. E. Jones, chairman of the state highway commission, is for South Carolina to buy cement in Europe, unless American prices are far better than Europe's and when this cement is brought to America's shores to contend that the government, under the constitution, has no right to lay a tax or a tariff on state owned goods. "The state would not be buying imported cement, as it has so often done in the past, but would be buying cement in Europe, from European manufacturers, and bringing it, as South Carolina owned goods, into America," according to Mr. Jones. "The state would rely, in defending its position, on the contention that the constitution forbids the taxing by the federal government of the property of a state," Mr. Jones declared.

"We will receive bids on May 15 for one million barrels of cement and if foreign manufacturers make lower proposals than those in this country we will buy from them, since it is our purpose to build every mile of paved road that we can, as cheaply as possible, with the money we have," Mr. Jones said. He declared further that should the cement be bought in Belgium or Norway it would be the property of South Carolina and the government would not have a right to collect tariff duty.

Report of a $2,000,000 cement plant "to aid in the state's road-building program" is another emanating from the commission's office. A group of South Carolina capitalists are said to have conferred with New York bankers during May over the possibility, and tests of raw materials are under way.

French Cement Firm Absorbs Nine Other Manufacturers

During the past several months the powerful French cement firm Etablissements Poliet et Chausson has been negotiating for the control of various cement plants throughout the country. At the last director's meeting, merger with the nine following firms was ratified: Societe des Chaux et Ciments de Tronville et Bar-le-Duc, Societe des Etablissements Douez Freres, Cimenterie de la Grande Paroisse, Societe Ceramique de l'Est, Societe "La Boulonnaise," Societe des Ciments Portland de Beaumont-sur-Oise, Docks des Materiaux du Sud-Quest, Stearinerie d'Arras at Ciments d'Arieux, and the Nouveaux Docks de la Construction.

Net profits of 22,410,819.90 francs were reported for the past year and a dividend of 100 francs per share was declared—an increase of 30 francs above that of last year. It was also decided to increase the capital from 80,000,000 to 100,000,000 francs.

Another important group has been created by the absorption by the Societe des Chaux et Ciments du Languedoc of the following firms: Societe Anoyme des Ciments d'Allas et Marnac, Societe des Chaux et Ciments de l'Ariege and the Union Commerciale et Industrielle du Languedoc. Profits for last year were 836,743 francs with a dividend of 50 francs per share.

Tariff Rate at Six Cents for Ordinary Portland

The Tariff Act of 1930, as finally adopted, contains the following provisions in sub-paragraphs (b) and (d) of Paragraph 205:

> (b) Roman, portland, and other hydraulic cement or cement clinker, 6 cents per one hundred pounds, including the weight of the container; white non-staining portland cement, 8 cents per one hundred pounds, including the weight of the container.
>
> * * *
>
> (d) Other cement, not specifically provided for, 20 per cent ad valorem.

Silos and Filters Being Added at Bay City Plant

Four 36 by 80 ft. silos are being constructed at the Bay City plant of the Aetna Portland Cement Company by the MacDonald Engineering Co. An installation of Oliver filters now being made will also increase capacity.

~ EDITORIAL ~

Surplus Electric Power a Source of Revenue

EIGHT or ten portland cement mills which produce their own electric light and power from the steam generated through the recovery of waste heat sell their surplus current to public utility companies. Two plants are each said to be realizing more than $10,000 per year from this source.

Several other plants are hooked up with public utilities power lines under agreements whereby the surplus power generated by the cement plant is delivered to the power company's lines, but no cash payment is made for the current delivered. The only advantage to the cement company lies in its right to draw on the power company for current during a temporary shutdown of its generators.

At still another mill the attempt to hook up with a power company failed because of the "take-it-or-leave-it" attitude of the latter. The power company not only refused to consider making payment for current delivered, but insisted on receiving monthly payments for "stand-by" service.

At a mid-western cement mill where this matter was considered, the plan had to be abandoned because it was found that such sale of surplus power would, under existing state laws, automatically classify the cement plant as a public utility and would place it under the state public utilities commission.

While the foregoing facts indicate that there are difficulties in the way, they can hardly be considered insurmountable. About 25 per cent of the existing cement mills have installed waste heat recovery systems, from which most of them are producing more electric power than they need. Surely, with so many plants producing power, more of them should make this feature of their operations a source of revenue.

The cement industry might well investigate this matter. Means can be found to remove legal obstructions; and not all power companies will be found unyielding in their attitude. Mills need not continue indefinitely to waste their surplus current.

A Tariff at Last

AT LAST portland cement is protected by a tariff. While the rate is not all that it might be, the fact that it is there is a matter for mild congratulation, some satisfaction and considerable inspiration.

Since our issue of June, 1927, our editorials have definitely recommended a tariff on cement to partially remedy the conditions analyzed at that time as contributing to the hardships facing the cement industry for the several years ahead. Now we have that tariff. With protection more nearly equaling other building materials, and with shipments already a trifle above last year, the added inspiration to still further progress cannot be denied.

The Return of the Smile

CEMENT manufacturers must have received a pleasant surprise, amounting almost to a shock, upon learning that shipments in the first five months of 1930 exceeded the corresponding period of 1929.

While construction work as a whole is lower this year than it was to the same date last year, the fact remains that the types of construction being pushed the hardest this year are the kinds that utilize concrete in great quantities. The same character of work should continue in large volume.

With this record of present achievement, added to the tariff news of last month and the indications of a better future, there is ample cause for the return of the smile.

Technical Knowledge Never More Important

NEVER before was a knowledge of the technical and mechanical phases of cement manufacture so important as it is today.

Specification requirements for ordinary portland cement are being raised. New specifications for high-early-strength cement have been established. Stronger and stronger grows the demand for special cements for special purposes, at prices not too high.

Organizations representing other basic building materials are better organized than in former years. Their promotional work is on a higher plane and is directed with better intelligence. This necessitates greater and more concentrated efforts by the cement industry, if the volume of production is to increase from year to year.

These problems must be faced, and their solution must come from within the mills. The chemists will have their part in it, and so will the mechanical engineers. Means must be found to maintain greater uniformity in the chemical composition and the fineness of the raw mix, and to obtain a uniform extent of calcination for all clinker. There will be problems involving waste heat recovery, and by-products that are now going to waste must be turned into sources of revenue. Production costs must be lowered.

New machinery and new arrangements of old equipment may be necessary. This will come on top of a plant investment that in many cases is now overburdened; but there is little choice in the matter.

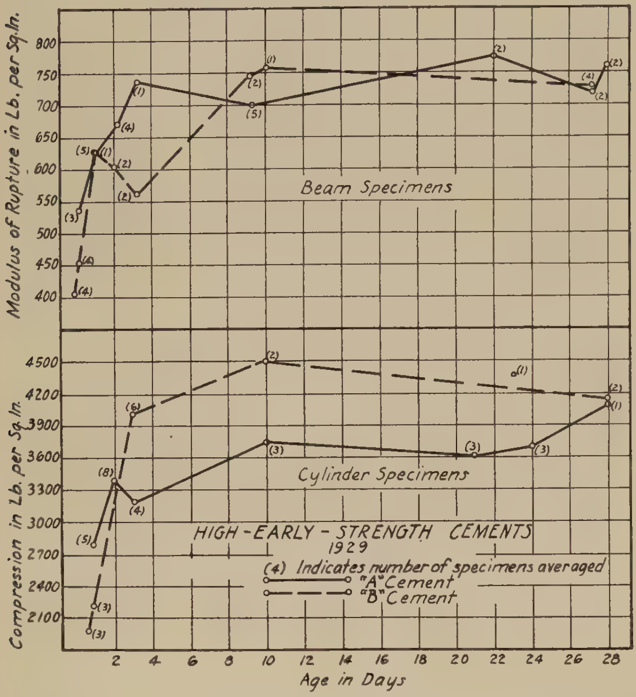
Here, again, is where technical and mechanical knowledge must come into play.

Performance of Two High Early Strength Cements in Concrete Pavements

Used for Closing Short Gaps in Main Highway—Tests Indicated Satisfactory Performance—Greatest Difference at Early Ages

By L. H. KOENITZER
Kansas State Agricultural College, Manhattan, Kansas

Quite often state highway departments use high early strength cements for patching holes in concrete pavements and for closing short gaps in a paved highway which have been left open to give newly made fills time to settle. It was under such conditions that two brands of high early strength cement were used on two gaps of pavement in the Kansas state highway system. Since the gaps to be closed were on a main highway it was necessary to open the pavement to traffic as soon as possible; and in view of this fact special precautions were taken to obtain reliable knowledge of the strength of the concrete before the barriers were taken down.



The highway department's standard paving mix for crushed stone, consisting of the proportions of 1:1¾:3½, by volume, was used. Sufficient water was added to give a slump of 1 in. There was no noticeable difference in the workability of the concrete containing the different brands of cement. The chart here illustrated shows that cement "A" indicated a higher strength during the first ten days than did cement "B," when specimens of concrete beams were tested in flexure with a portable field beam-testing machine. After the first ten days the flexural strengths were practically the same.

When the specimens were tested in compression cement "A" indicated a higher strength than did cement "B" at the age of 24 hours. At the end of 72 hours cement "B" showed a higher strength than did cement "A," and this relation continued until the age of 28 days was reached, when the strengths were almost identical. A more recent study of these two particular brands of cement indicated that cement "A" is considerably stronger during the first 48 hours than cement "B" when the specimens are tested in flexure.

The number in parentheses at each point on the curves in the chart represents the number of tests averaged for that particular point.

A recent study by the writer of fourteen brands of standard portland cements and four high early strength cements indicate that there is even a greater variation in the strength-making qualities between certain brands of standard portland cements, although all brands of cement developed sufficient strength.

Missouri Portland Plans Mill at Tulsa, Oklahoma

With the site not yet determined, plans are going forward for the construction of a new cement manufacturing plant near Tulsa, Oklahoma, for the Missouri Portland Cement Company.

Announcement to this effect was made by Geoff A. Sager, chemical engineer of the company, and P. H. Blaise, general superintendent of all plants at a meeting of the local chamber of commerce board of directors.

Definite announcement of the location will be withheld until core drilling at possible quarry sites is completed, it was said. The plant will use the wet process and have a daily capacity of 3,000 barrels.

The plant will be financed almost in its entirety by the Missouri Portland company. It is possible that some stock will be placed on the public market. The company now operates two plants, at St. Louis and Kansas City.

Cement Institute Issues Rate Books on Carload Freight

The newly established Freight Rate Bureau in the Chicago division office of the Cement Institute has compiled and published a set of twelve rate books covering the twelve states in the division. The rate books give the carload freight rate per hundred pounds of cement from various points of origin to all destinations.

The Freight Rate Bureau of the Institute will have no part in filing or settling claims or in attempts to readjust freight rates. Its sole duty is that of furnishing information on freight rates and keeping in touch with changes in rates.

The Chicago office of the Cement Institute is located at 176 West Adams Street.

Belgian Cement Firms Active

The Ciments de Thieu of Brussels, Belgium, report profits of 2,140,721 francs for the past year as compared with 5,261,420 francs the preceding year.

Societe Belge des Betons report profits of 1,251,795 francs for the past year.

Belgian Congo cement firms report profitable year. Ciments du Katanga showed a net profit of 14,886,446 francs and distributed a dividend of 250 francs per share. Enterprises de Travaux en Beton au Katanga showed net gains of 8,344,216 francs and declared dividends of 150 francs per share.

Ideal Production Shows Big Gain Over 1929

The quarterly report of the Ideal Cement Company, Denver, Colo., shows that it is 220,000 barrels of cement ahead of the production record of last year, for the same period. If production continues at the present rate, and it is believed it will, the production for 1930 will top that of last year by about 900,000 barrels. Extensive road building is one of the contributing factors.

Safety and Research in Spotlight at Portland Cement Association Meeting

Organization and Member Mills Receive Distinguished Awards—Twenty-Six Mills Given Safety Trophies, With Possibility of One More — Necessity for Continued Research is Emphasized

RESEARCH and more research, and no diminution in the accident prevention campaign shared the center of the stage in the annual spring meeting of the Portland Cement Association at the Biltmore Hotel in New York City on May 26th, 27th and 28th.

Holmes Award Presented

The culminating event in the accident prevention program came on Wednesday afternoon, May 28th, when Daniel Harrington, chief engineer of the United States Bureau of Mines, and a director of the Joseph A. Holmes Memorial Association, conferred upon the Portland Cement Association the Joseph A. Holmes Safety Award for 1929. This award carried with it a citation for unusual achievement in preventing loss of life or injury to the workers employed in the cement mills of its members. In a second ceremony following the Holmes award, twenty-six cement mills, representing almost every producing section of the United States, were formally presented with the Portland Cement Association safety trophy for 1929, awarded to each for completing the year without the accidental loss of time or permanent injury to a single workman. One other mill may be awarded the trophy later, after a final decision is made on the question of whether or not a certain no lost-time accident has produced a permanent disability.

New Record Made

Even if the total were to remain at twenty-six, the record would constitute a remarkable performance, with this number of mills, out of 138 mills reporting, going through a full year without a lost-time accident. In striking contrast to the 1929 performance, it was recalled that it was no longer ago than 1924 when the first cement mill succeeded in making a no-lost-time record, after the accident prevention work of the industry had been in progress for ten years.

Since 1924, when the first mill made its no-accident record, 59 mills have made similar one-year records. The progressive success of the safety movement is well shown from the fact that 44 per cent of the total number of these records occurred in 1929. Last year approximately one-fifth of all of the operating cement mills within the membership of the Portland Cement Association completed the year without a lost-time accident. According to data recently released by the National Safety Council,

Representatives of the 26 cement mills having no lost time accidents in 1929 were the guests of J. B. John, chairman of the committee awarding the Portland Cement Association safety trophies, during their stay in New York the cement industry's accident frequency rate for 1929 was the lowest for any industry reported and less than half the average.

Presentation of Association Trophy

The Portland Cement Association safety trophy was formally presented to the twenty-six winning mills by J. B. John, president of the Medusa Portland Cement Company and chairman of the association's committee on Accident Prevention and Insurance. Two delegates from each of the winning mills had been selected by their respective organizations to make the trip to New York to receive the trophies. At the formal ceremony, at which President Frank H. Smith of the association presided, the records of the winning mills were read and certified. The delegates occupied places of honor at the front of the assemblage in the Biltmore music room, and were called upon to arise and receive the distinguished honor from Chairman John.

The delegates were the guests of Mr. John at dinner in the Hotel Commodore, New York, on Monday evening, May 26th, at luncheons on May 27th and 28th, and at a formal dinner in the Biltmore on May 27th. Before returning to their homes many of them went to Easton, Pa., for the regional safety meeting on May 29th, where they were the guests of the eastern cement mills at a gathering of 250 delegates representing the Lehigh Valley Safety Conference.

Holmes Award Highly Prized

The Joseph A. Holmes award, won by the association, carries with it unusual significance. So far as is known, no other trade association has ever received this or any similar award in the field of accident prevention. The Holmes award was founded in honor of the first director of the U. S. Bureau of Mines, who was also the author of its safety program, as a means of conferring distinction upon industrial concerns for conspicuous service in the work founded by Director Holmes.

In the citation announcing the association award, attention is called particularly to the surprising increase in the number of mills operating for a calendar year without accident.

Gabriel S. Brown, president of the Alpha Portland Cement Company, past president and for many years a director of the Portland Cement Association, accepted the Holmes Award on behalf of the association and its members.

Recognize Importance of Research

The value of the research work of the association and the importance of carrying on such work unabated was fully recognized in many of the formal and informal discussions among the delegates to the spring meeting. The prevalent feeling was that only through the generous support of the membership can this work be developed to its full growth. With such support, the present uses of cement can be extended, new uses can be developed, and knowledge can be disseminated regarding the proper methods of making concrete.

The spring meeting adjourned in a spirit of good will and fellowship that promises well for the future of the industry.

Algerian Cement Firms Combine

The Algerian cement firms, Societe des Chaux et Ciments de Rivet-Alger and Ciments Portland de l'Afrique du Nord, have combined under the name, Societe Nord-Africaine des Ciments de Lafarge.

Boric Acid Lowers Temperature of Calcination

New Investigation by Bureau of Standards Now Under Way—Preliminary Results Are Favorable

The current issue of the Mill Section of CONCRETE contains the second and final installment of a paper by W. C. Hansen, research associate, United States Bureau of Standards, on the influence of ferric oxide, magnesia and soda upon the temperature at which melting starts, when added individually and collectively to mixtures of lime, alumina, and silica having compositions similar to portland cement.

The Bureau of Standards now announces, through Technical News Bulletin No. 157 (May, 1930), an investigation to determine the possibility of producing a well-burned clinker at a relatively low temperature, by the use of a small quantity of boric acid as a flux. The energy changes which take place during burning were studied by means of heating curves. A study of these curves led to a brief investigation of the various constitutents normally present in portland cement.

Heating curves of mixtures of $CaCO_3$ and SiO_2 in the ratio of 2 CAO: SiO_2 gave evidence of (1) an exorthermic reaction at about 1,420 deg. C., and (2) an endothermic reaction immediately following, and probably starting before the first reaction is finished. The first is thought to be the formation of $2CaO.SiO_2$ as no indication of it is found on the cooling curve, or upon reheating. Heating curves of $2CaO.SiO_2$ clinker fail to show this break.

The second reaction is reversible, and is probably the inversion of beta $2CaO.SiO_2$ to the alpha form, as the temperature at which it occurs corresponds with the generally accepted temperature for this transition.

The first reaction is not affected by the addition of small quantities of boric acid to the raw mixture, but the second was found to occur at progressively lower temperatures with increasing amounts of boric acid. The refractive indices of the clinkers were also lowered by the addition of boric acid, and from these two facts it is held possible that some of the boric acid forms a solid solution with the silicate.

Mixtures of CaO, SiO_2, Al_2O_3, Fe_2O_3, and MgO approximating the composition of portland cement, gave curves similar to those for the CaO-SiO_2 mixtures. The exorthermic break came at about 1,300 deg. C. in these mixtures. The addition of boric acid had little apparent effect on the shape of the curves. The clinkers containing boric acid, however, were better burned than those without boric acid. Contrary to expectation, the clinkers containing boric acid also had a higher percentage of free lime than the others.

It is planned to make a systematic study of the portion of the ternary system CaO-SiO_2-B_2O_3 in the region between $CaO.SiO_2$, $3CaO.SiO_2$, and 5 per cent B_2O_3 in order to interpret the phenomena already observed as well as to obtain additional information.

Illinois Plants Report Improved Employment

Improved employment conditions are reported by three large Illinois cement plants. The Alpha Portland Cement Company plant at LaSalle reports operation in full swing and the employment of some extra help. The Marquette plant at LaSalle has hired a large number of men in the past month, and Lehigh officials report that business at the plant at Oglesby is improved.

Lehigh Valley Safety Conference Is Hugh Success

With 250 Delegates and Speakers of National Prominence Meeting Has Nation-Wide Aspect—Discuss Numerous Features of Accident Prevention—Some Safety Kinks—Trophy Delegates Are Guests

By NORMAN M. STINEMAN
Editor of "Concrete"

SELDOM has the interest in accident prevention been so well demonstrated as in the assemblage of 250 delegates in Easton, Pa., on May 29th, at a regional safety meeting of the Portland Cement Association.

The meeting was held at the Hotel Easton under the auspices of the Lehigh Valley Safety Conference. An added touch of interest was that the conference had, as its guests, the trophy delegates from all parts of the United States, who, at a ceremony in New York on the previous day, had received the Portland Cement Association safety trophy in behalf of their respective mills.

W. W. Hamilton, of the Alpha Portland Cement Co., presided over the meeting, in which accident prevention was discussed from a number of different angles.

The first speaker was A. J. R. Curtis, assistant to the general manager of the Portland Cement Association, who is in charge of the association's accident prevention program. Mr. Curtis outlined the work thus far accomplished, and emphasized in particular the unequalled record of 1929, when 26 mills out of 138 mills reporting operated through the year without a single lost-time accident. One other mill, he said, may receive the award after final decision is made on the classification of an accident under question.

A Paper From the Bureau of Mines

An excellent paper on the subject of "What Can We Do to Prevent Accidents?" was read by C. W. Jeffers, mining engineer, U. S. Bureau of Mines. No other industry, Mr. Jeffers said, has made progress in safety even approaching the accomplishments of the cement industry. In dealing with the subject of hazards, the speaker divided them into (1) mechanical hazards, (2) physiological hazards, and (3) psychological hazards.

Mr. Jeffers stated that mechanical hazards which workmen can see, but which the company makes no effort to remove, are beyond question the most demoralizing. Physiological hazards are those resulting from overfatigue, with consequent loss of alertness. Psychological hazards are those arising from improper mental attitudes toward accident prevention efforts. These may take the form of indifference, carelessness, or downright obstinacy. Workmen who, after a reasonable length of time, refuse to correct this attitude should be discharged, for they constitute a menace both to themselves and to others.

Good Housekeeping

Frank Leh, of the Lone Star Cement Co. of Pennsylvania, presented a very practical paper on "Good Housekeeping," in which he enumerated a number of typical signs of bad housekeeping in a cement plant. These may range all the way from loose boards to broken handrails or unprotected machinery. He mentioned the installation of dust collecting systems as one of the greatest single aids in the improvement of plant housekeeping.

The speaker then read a contributed story in which the prospective home of a cement mill worker, dilapidated and replete with dangerous features, was compared with a cement plant in similar condition. The moral of the story is that good housekeeping is as important in the mill where the bread-winner of the family works as in the

Banquet closes meeting of 250 safety delegates at Easton home that shelters his family. Several delegates requested and were promised copies of the story.

Some Safety Measure Kinks

Many interesting kinks in dealing with safety measures were brought to light in a round table discussion, led by R. B. Fortuin, of the Penn-Dixie Cement Corp., and G. B. Searles, of the Nazareth Cement Co. It was generally agreed that while nothing can be accomplished without the whole-hearted support of the management, the final success of a safety campaign rests with the foremen, who in the nature of things are in immediate contact with the workmen.

Monthly safety meetings, talks with individual workmen, judicious use of signs, special devices used as reminders, contests between departments, fostering of local safety organizations, were some of the many measures discussed. Several speakers pointed out that the greatest possible results are obtained where the cement mill fosters or co-operates with a community safety organization.

The final features of the afternoon program were a talk on safety by Col. Henry A. Reninger, in charge of accident prevention and insurance work for the Lehigh Portland Cement Co. and president of the National Safety Council in 1929; a most inspiring address by E. C. Spring, and a safety playlet entitled "Gateman Bill," presented by the junior dramatic club of the Easton high school. Mr. Spring, who is vice-president of the Lehigh Valley Transit Co. and a director of the Lehigh Valley Safety Council, spoke of the importance of safety because of the grief and distress that it prevents rather than because of the time and money saved.

Dr. Grayson Speaks in Evening

The evening program consisted mainly of a banquet, at which the chairman was Fred B. Hunt, of the Nazareth Cement Co.; the toastmaster was M. S. Ackerman, Jr., of the Lawrence Portland Cement Co., and the principal address was delivered by Dr. Theodore Grayson, head of the Wharton School of Finance of the University of Pennsylvania.

What Can We Do to Prevent Accidents?

Recommendations Include Rigid Rules and Enforcement and Proper Discipline—Mechanical Hazards Dangerous Directly and Indirectly—Work of Holmes Safety Assn.

By **C. W. JEFFERS**
Mining Engineer, United States Bureau of Mines

THOSE who have been interested in the great safety movement which has swept the country the last few years realize that accidents do not just happen, and that there are better ways to avoid injury than by merely dodging missiles. We are confronted with the fact that there is reason, a responsibility, and a means of prevention for each accident.

Accident-free operation may not be attainable in a world in which familiarity breeds indifference toward known hazards and in which we have stubborn, careless, reckless, and thoughtless individuals. Many persist in saying that as long as we have industry we will have accidents. This professed belief is offered as an excuse for each accident as it occurs. Some of the wonderful performances being turned in today in industry along the lines of safety make it pertinent to inquire whether we do not use the natural hazard idea to cloak human and mechanical failings.

Safety Must Originate With Management

Safety in an organization must originate in the management and be instilled in the minds of each employee before we can approach that goal of no-accident operation. When each individual strives to be a safe worker regardless of his position in the company then we can expect real results in accident prevention. After we have this determination to eliminate accidents we then have certain steps through which we may go to build up this safety spirit. To do this we must have the co-operation of the entire personnel.

The first thing to be done is to find out what are the causes of the accidents which are occurring. They should be so recorded that a thorough analysis can be made. A close study of such a record should reveal these causes and put us in a position to eliminate them.

Establish Rigid Safety Rules

Rigid rules and regulations governing safe practices and operation of machinery should be established, not forgetting the necessity for proper discipline and enforcement. Safety is education, we are told. This is true—we must instruct our men as to which practices are dangerous, remembering that some men are easier to educate than others. Reasons for the establishment of certain rules and regulations should be explained along with their adoption. A reasonable length of time should be allowed for the thorough placing of the safety program before all employees. We must then eliminate the careless, the thoughtless, and the reckless or put them in places where they can do no harm either to themselves or to fellow employees. For some, the fact that certain practices will not be tolerated is more easily learned than a knowledge of accident hazards. It is an established fact that the organizations producing good accident records are the ones in which we find good discipline.

Mechanical Hazards Must Be Eliminated

Close and rigid inspection at regular intervals, to locate plant hazards and eliminate them before accidents occur,

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An address before Lehigh Valley Safety Conference, Easton, Pa., May 29, 1930.

is an important item in accident prevention. The proper guarding of mechanical equipment and the correction of improper working conditions is clearly the work of the management. There is nothing that will do more harm to the advancement of the safety spirit among the personnel than a mechanical hazard which all can see and which the company makes no attempt to eliminate. It is no more than fair, if you want a man to work safely, that you furnish him with equipment which is mechanically safe and able to do the work. When workmen see that the company is doing its part they will ordinarily fall in line and give their co-operation.

The success or failure of an accident prevention program rests largely with the foreman. He must use common sense, logic, initiative, and last, but by no means least, in so far as safety is concerned he must be willing to accept responsibility. He is in a position to know the men who work for him, he can instruct and train them, and correct improper practices before they cause trouble. Accidents are just as much his responsibility as any other phase of his work, which includes production, discipline, order, morale and good housekeeping.

It has been estimated that from 75 to 90 per cent of the accidents which occur are attributed to supervisory conditions within the control of the foreman. A measure of the success of an accident prevention program is the amount of responsibility the management and foremen are willing to assume for accidents, not the number of excuses or reasons they can think up to explain them. In training men for foremen jobs they should be taught to assume this responsibility for accidents as well as for any other division of their work. Any man who aspires to better things should not forget that fear to accept responsibility keeps more men in subordinate positions than any other factor.

Value of First Aid Training

As you know, one of the primary objects of the Bureau of Mines is to bring about safer and more healthful working conditions among the employees of the great mining, quarrying, metallurgical, and oil and gas industries. We believe that first-aid training is an important factor of any accident prevention program.

During 1929 more than 81,000 workers were trained in first aid and mine rescue methods, bringing the total so trained by the bureau since its establishment to approximately 365,000. In many large organizations 100 per cent of the employees have been trained in first aid work, with attending decreases in the number of accidents. Too much stress cannot be laid on the training being carried on to this extent. Almost without exception our inquiries with regard to the effect of a program of this kind have been answered with the statement that accidents have decreased at plants where such training has been done. There are several things that first aid training does to stimulate safety:

1. It fosters thinking in terms of safety.
2. It makes a man think of the cost of an accident in physical pain to himself.
3. It teaches him how accidents occur and how they can be avoided.
4. It gives him an understanding of the make-up of the body.
5. It trains him to care for the injured, and the satisfaction gained from an act of this kind can not be measured.

F. J. Chesterman, vice-president and general manager of the Bell Telephone Company of Pennsylvania, in a recent statement said, "First aid is one of our most important accident prevention activities." It has been found that first aid men are not the ones who sustain injuries. So why not have all employees first aid men?

Approximately 20,000 workers in the portland cement industry have been so trained. At 21 cement plants every employee has been given a course in first aid and safety training, and the plants have been awarded a certificate of 100 per cent training by the U. S. Bureau of Mines.

Tying In With Local Chapters of Holmes Safety Association

For the promotion of safety, health and welfare in and about various operations it has been found extremely helpful to sponsor a local safety organization. We must give safety a good measure of publicity. An organization of this kind can do much toward this end. The work of the Holmes Safety association in promoting and sponsoring safety organization, and as a medium for bettering safety, health, and welfare conditions can not be too highly praised.

In 1916 the Joseph A. Holmes Safety Association was organized by 24 of the leading technical societies and mining organizations to perpetuate the memory of Dr. Joseph A. Holmes, first director of the Bureau of Mines and a pioneer in the safety movement. Originally the activities of the association were divided into three sections, as follows:

1. The awarding of gold, silver and bronze hero medals and diplomas to individuals who have risked their lives in an effort to save the life of a fellow worker.
2. The awarding of honorariums to operating companies who have developed and installed the most efficient safety devices, appliances or methods.
3. The organization of Holmes safety chapters for the advancement of safety in mining, metallurgical, petroleum, quarrying or allied industries.

The Joseph A. Holmes Safety association continues to award honorariums and to present hero medals, but the direction and control of the safety chapters have been delegated to the Holmes Safety association, which was formed in 1926 for this purpose.

At the present time the Holmes Safety association is a national organization, the objects of which are to arrange and hold meetings and provide for organized co-operative effort toward:

1. The prevention of accidents and the improvement of the health conditions of all persons connected with mining, metallurgical, petroleum, quarrying, and allied industries at work, in the home, and in public places, and to promote the general welfare of its members.
2. The dissemination of information and instructions on all subjects related to the promotion of health and safety.
3. The promotion of training in first-aid and in mine-rescue.
4. The closest possible relations with existing organizations having for their purpose the promotion of health, safety and efficiency, including local, state, and federal agencies.
5. The promotion of educational, social and recreational activities.

Giant Dividend

The Giant Portland Cement Co. declared a regular semi-annual dividend of $1.75 on preferred stock, payable June 16th to stock of record June 2nd.

Lowering the Temperature of Calcination

Experimental Results with Use of Magnesia, Ferric Oxide and Soda in Lowering Temperature of Liquid Formation in Certain Portland Cement Mixtures

By W. C. HANSEN
Research Associate, Bureau of Standards

Parts I, II and III of this valuable report, published in our June issue, covered the purpose of these experiments, the test procedure followed, and the behavior of the mixtures on being heated. This issue concludes the paper with a detailed description of the experimental results—The Editors.

Part IV. Experimental Results

1. THE SYSTEM $CaO\text{-}Al_2O_3\text{-}SiO_2$

FROM the work of Rankin and Wright, it is known that in all mixtures of $3CaO.SiO_2$, $3CaO.Al_2O_3$ and $2CaO.SiO_2$ the first liquid forms at 1,455 deg. C. For the sake of comparison with the other systems two heating-curve diagrams are given here for mixtures in this system. The compositions in terms of the oxides of the equilibrium compounds are given in Table 2.

Figure 2 shows that an energy change occurs in this system at 1,455 deg. C. Quenchings were made from 1,450 and 1,460 deg. C. The charge quenched from 1,450 deg. C. showed no signs of melting and consisted of $3CaO.SiO_2$, $2CaO.SiO_2$, and $3CaO.Al_2O_3$. The charge quenched from 1,460 deg. C., showed that melting had started, and the charge consisted of glass, $3CaO.SiO_2$, and $2CaO.SiO_2$. Melting, therefore, begins in this mixture at 1,455 deg. C., and $3CaO.Al_2O_3$ disappears at this temperature.

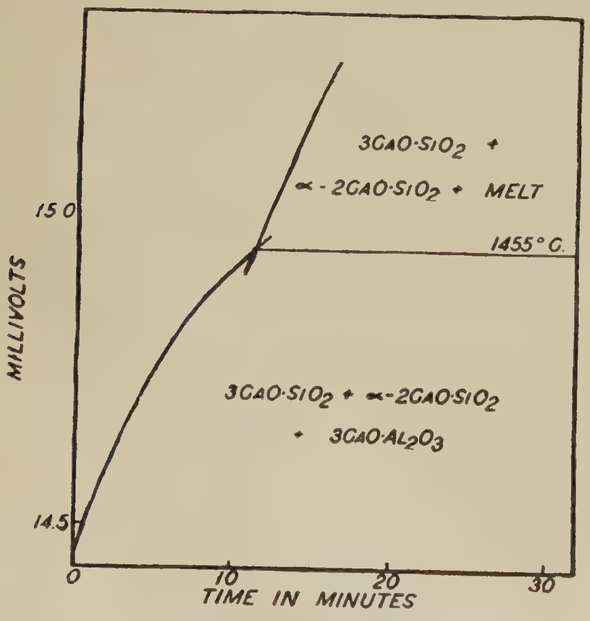

Figure 2. Heating curve diagram from the mixture: *CaO*, 69.5; *Al_2O_3*, 6.8; *SiO_2*, 23.7

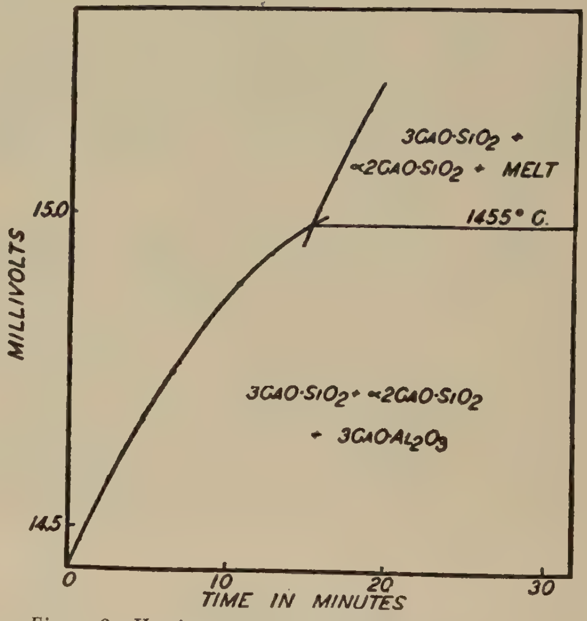

Figure 3. Heating curve diagram from the mixture: *CaO*, 66.8; *Al_2O_3*, 15.2; *SiO_2*, 18.0

Figure 3 is the heating curve obtained from a mixture of the composition $8CaO + Al_2O_3 + 2SiO_2$. Quenchings made from 1,450 and 1,460 deg. C. showed that melting begins at 1,455 deg. C. in this mixture, and that $3CaO.Al_2O_3$ disappears at this temperature.

2. THE SYSTEM $CaO\text{-}MgO\text{-}Al_2O_3\text{-}SiO_2$

Figures 4 and 5 are the heating-curve diagrams obtained from two mixtures in the system $CaO\text{-}MgO\text{-}Al_2O_3\text{-}SiO_2$. A charge of sample 3, Table 2, quenched from 1,370 deg. C., consisted of $3CaO.SiO_2$, $2CaO.SiO_2$, $3CaO.Al_2O_3$, and MgO. A charge quenched from 1,380 deg. C. consisted of $3CaO.SiO_2$, $2CaO.SiO_2$, MgO, and glass. Melting starts in this mixture at 1,375 deg. C., and $3CaO.Al_2O_3$ disappears at this temperature.

Figure 5 shows the same break at 1,375 deg. C., due to the formation of liquid in sample 4, Table 2. A charge quenched from 1,380 deg. C. consisted of $3CaO.SiO_2$, $3CaO.Al_2O_3$, MgO, CaO, and glass. $2CaO.SiO_2$ disappears at 1,375 deg. C. in this mixture, and CaO appears as a new phase. A charge quenched from 1,400 deg. C. consisted of $3CaO.SiO_2$, CaO, MgO, and glass. $3CaO.Al_2O_3$ disappears at 1,390 deg. C. in this sample by partially dissolving and partially dissociating, forming CaO. The $2CaO.SiO_2$ disappears at 1,375 deg. C. in this mixture partially by dissolving and partially by reacting with

$3CaO.Al_2O_3$ to form $3CaO.SiO_2$. There is not sufficient $2CaO.SiO_2$, however, to react with all of the $3CaO.Al_2O_3$, and the remaining $3CaO.Al_2O_3$ disappears at 1,390 deg. C.

This reaction of $3CaO.Al_2O_3$ is one of importance to the cement manufacturer. The SiO_2 and Al_2O_3 of a portland cement raw mixture can combine with a certain maximum amount of CaO. It may be difficult, however, to get this CaO into combination in practice. If such a difficulty were encountered, the most natural thing to do would be to increase the time and degree of heating. Such a procedure would not help when the uncombined CaO is due to the dissociation of $3CaO.Al_2O_3$. This CaO must be recombined during cooling, and unless the rate is such as to allow the CaO to react, with the liquid and form $3CaO.Al_2O_3$, the cement will contain uncombined CaO.

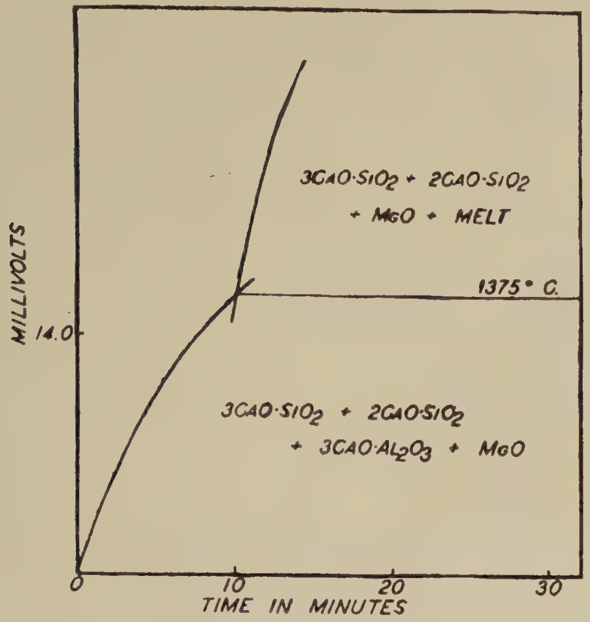

Figure 4. Heating curve diagram from the mixture: CaO, 65.7; Al_2O_3, 6.5; SiO_2, 22.5; MgO, 5.3

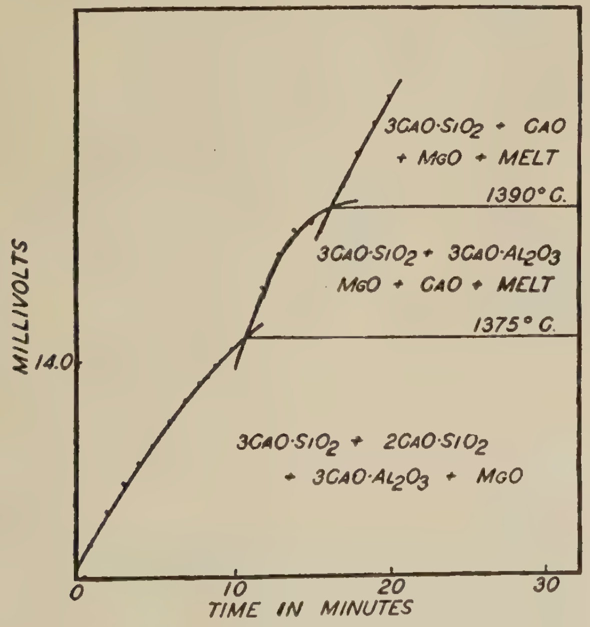

Figure 5. Heating curve diagram from the mixture: CaO, 67.3; Al_2O_3, 6.5; SiO_2, 20.9; MgO, 5.3

3. THE SYSTEM $CaO-Al_2O_3-Fe_2O_3-SiO_2$

The crystalline phases formed in these mixtures, samples 5 and 6, Table 2, are $3CaO.SiO_2$, $2CaO.SiO_2$, $3CaO.Al_2O_3$, and $4CaO.Al_2O_3.Fe_2O_3$. The first three phases were easily identified, but the $4CaO.Al_2O_3.Fe_2O_3$ was present in the annealed samples as very small grains and as edges on the other grains. The optical properties of these small grains agreed with those of $4CaO.Al_2O_3.Fe_2O_3$, but to make more certain that this compound exists in equilibrium with $3CaO.SiO_2$, $2CaO.SiO_2$, and $3CaO.Al_2O_3$, a preparation of the composition CaO 56.5, Al_2O_3 19.7, SiO_2 10.5, and Fe_2O_3 13.2 per cent was made up and examined. Such a mixture at equilibrium contains by calculation 40 per cent of $4CaO.Al_2O_3.Fe_2O_3$. The $4CaO.Al_2O_3.Fe_2O_3$ was well crystallized in this preparation and was positively identified, both by microscopic and X-ray examination, together with $3CaO.SiO_2$, $2CaO.SiO_2$, and $3CaO.Al_2O_3$.

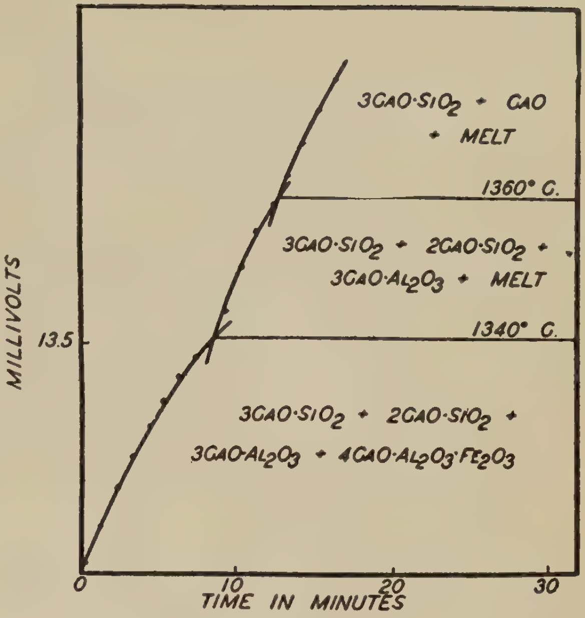

Figure 6. Heating curve diagram from the mixture: CaO, 69.2; Al_2O_3, 6.6; SiO_2, 20.9; Fe_2O_3, 3.3

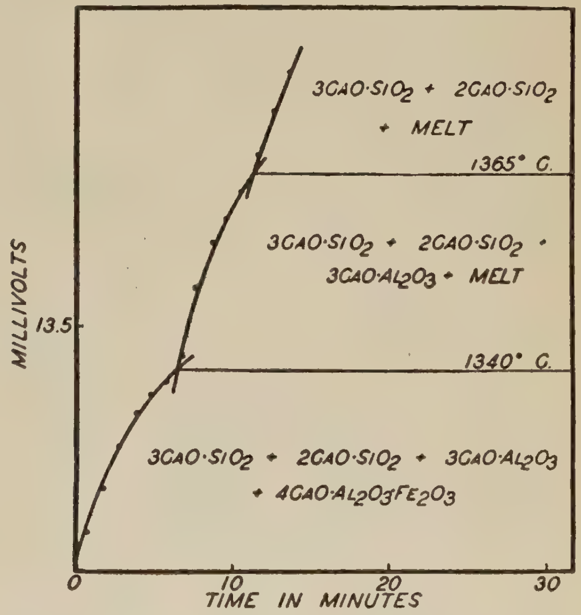

Figure 7. Heating curve diagram from the mixture: CaO, 67.1; Al_2O_3, 6.6; SiO_2, 23.0; Fe_2O_3, 3.3

The heating curves obtained from mixtures 5 and 6

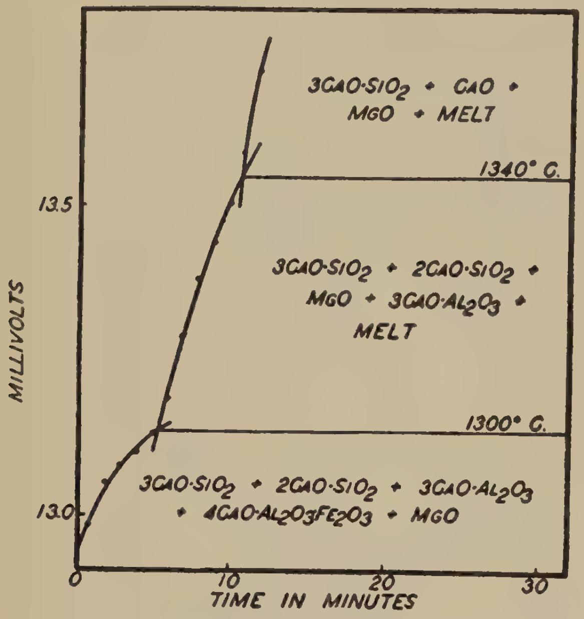

Figure 8. *Heating curve diagram from the mixture: CaO,* 65.6; *Al_2O_3,* 6.3; *SiO_2,* 19.8; *Fe_2O_3,* 3.1; *MgO,* 5.2

are given in Figures 6 and 7. Quenchings from 1,330 deg. C. and 1,350 deg. C. show that the break at 1,340 deg. C. is due to the beginning of melting, and that $4CaO.Al_2O_3.Fe_2O_3$ disappears at this temperature in these mixtures. At 1,360 deg. C. in sample 5, Table 2, and at 1,365 deg. C. in sample 6, Table 2, the $3CaO.Al_2O_3$ disappears. In sample 5, CaO appears at 1,360 deg. C., due to the dissociation of the $3CaO.Al_2O_3$.

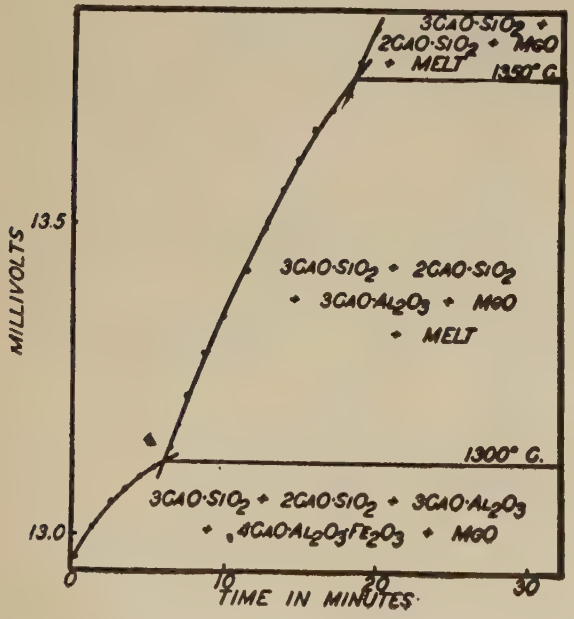

Figure 9. *Heating curve diagram from the mixture: CaO,* 63.6; *Al_2O_3,* 6.3; *SiO_2,* 21.8; *Fe_2O_3,* 3.1; *MgO,* 5.2

4. THE SYSTEM $CaO\text{-}MgO\text{-}Al_2O_3\text{-}Fe_2O_3\text{-}SiO_2$

Figures 8 and 9 are the heating-curve diagrams for the two mixtures, samples 7 and 8, Table 2, studied in this system. The crystalline phases in these mixtures at equilibrium are $3CaO.SiO_2$, $3CaO.Al_2O_3$, $2CaO.SiO_2$, $4CaO.Al_2O_3.Fe_2O_3$, and MgO.[7] In these samples as in samples 5 and 6 the ferric-oxide containing phase was present as small grains and as edges on the other grains. The mixture CaO 57.5, Al_2O_3 16.7, Fe_2O_3 8.4, MgO 4.3, SiO_2 13.1 was made up and studied as a further check on the ferric-oxide containing compound existing in equilibrium with $3CaO.SiO_2$, $2CaO.SiO_2$, and $3CaO.Al_2O_3$. In this mixture the $4CaO.Al_2O_3.Fe_2O_3$ was present as well-developed crystals and was identified together with the other phases listed above.

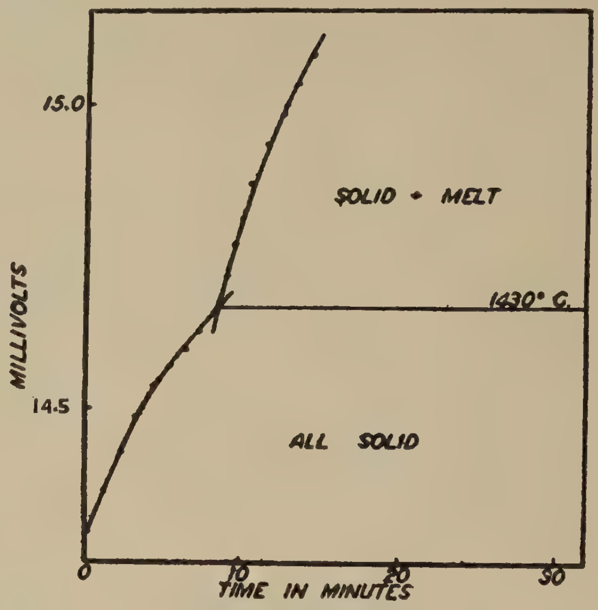

Figure 10. *Heating curve diagram from the mixture: CaO,* 67.9; *Al_2O_3,* 6.6; *SiO_2,* 20.9; *Na_2O,* 2.2

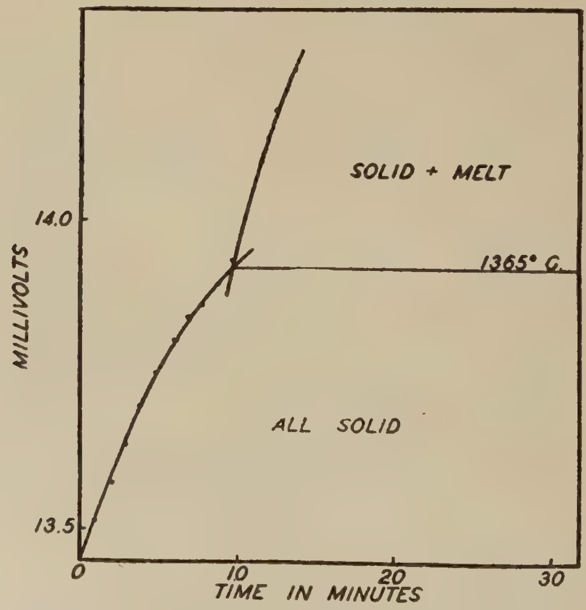

Figure 11. *Heating curve diagram from the mixture: CaO,* 64.3; *Al_2O_3,* 6.3; *SiO_2,* 22.0; *MgO,* 5.3; *Na_2O,* 2.1

The breaks at 1,300 deg. C. in the heating curves (Figs. 8 and 9) were shown by quenching to be caused by the formation of liquid. The $4CaO.Al_2O_3.Fe_2O_3$ disappears at this temperature. At 1,340 deg. C. the $3CaO.Al_2O_3$ in sample 7 disappears and CaO appears. At 1,350 deg. C. in sample 8 the $3CaO.Al_2O_3$ disappears.

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[7] In a former publication (Hansen and Brownmiller, *Am. J. Sci.*, 15, p. 225; 1928), it was reported that MgO enters into solid solution with $4CaO.Al_2O_3.Fe_2O_3$, the end member of the series being $4CaO.2MgO.Al_2O_3.Fe_2O_3$. Magnesia in excess of that required for the above combination was found to remain as uncombined MgO. More recent information obtained in this laboratory indicates that the amount of the solid solution is much smaller than had previously been reported. Although there is no reasonable doubt that a large part of the magnesia remains uncombined, the exact nature and degree of the reaction by which the $4CaO.Al_2O_3.Fe_2O_3$ is changed in color and pleochroism in the presence of a small amount of magnesia has not been determined. This problem is under further investigation. At present the magnesia may be considered as remaining essentially uncombined, and the iron compound as existing essentially in the form $4CaO.Al_2O_3.Fe_2O_3$.

5. SYSTEMS IN WHICH Na_2O IS A COMPONENT

The curves given in Figures 10, 11, 12, and 13 show the influence of Na_2O in lowering the temperature at which liquid is formed when it is added to the various systems. As was pointed out in the introduction, no data can be given at this time on the equilibrium compounds in these systems, so, in the diagrams, all of the solid phases are grouped under the one term, "solid." Quenchings and microscopic examinations were made to determine the temperatures at which liquid is formed in the mixtures. Liquid formation starts in the mixture of CaO, Al_2O_3, SiO_2, and Na_2O, sample 9, Table 2, Figure 10, at 1,430 deg. C.; in the mixture of CaO, Al_2O_3, SiO_2, MgO, and Na_2O, sample 10, Table 2, Figure 11, it starts at 1,365 deg. C.; in the mixture CaO, Al_2O_3, SiO_2, Fe_2O_3, and Na_2O, sample 11, Table 2, Figure 12, liquid is formed at 1,315 deg. C.; and in the mixture of CaO, Al_2O_3, SiO_2, Fe_2O_3, MgO, and Na_2O, sample 12, Table 2, Figure 12, liquid formation starts at 1,280 deg. C. The break in the heating curve Figure 12 at 1,370 deg. C., and the break in heating curve Figure 13 at 1,315 deg. C. are probably caused by the disappearance of a crystalline phase at each of these temperatures. The nature of the phases disappearing at these temperatures was not determined.

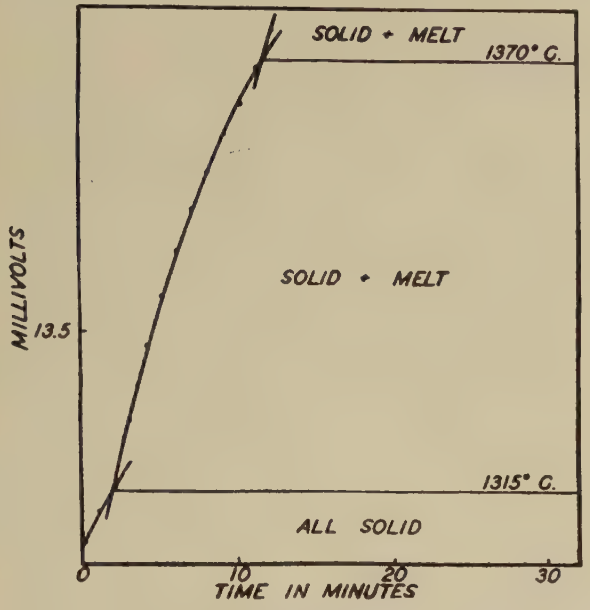


Figure 12. *Heating curve diagram from the mixture: CaO,* 65.7; *Al_2O_3,* 6.4; *SiO_2,* 22.5; *Fe_2O_3,* 3.2; *Na_2O,* 2.2

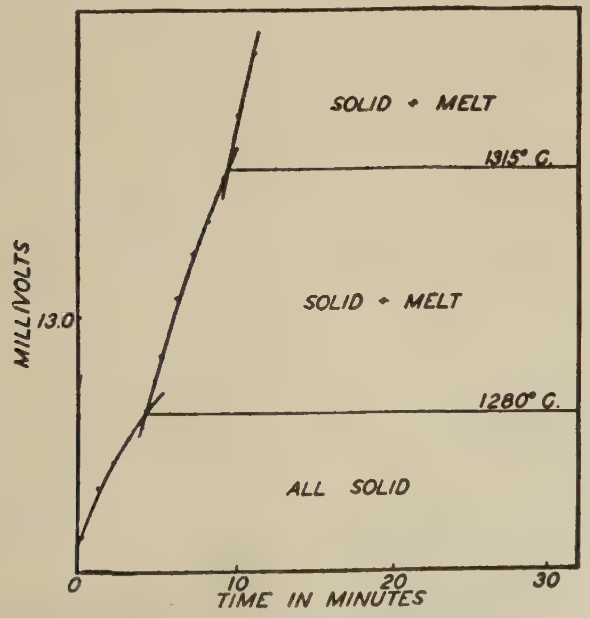


Figure 13. *Heating curve diagram from the mixture: CaO,* 62.3; *Al_2O_3,* 6.1; *SiO_2,* 21.3; *Fe_2O_3,* 3.1; *MgO,* 5.1; *Na_2O,* 2.1

6. COMMERCIAL PORTLAND CEMENT CLINKERS

Figures 14, 15, 16, and 17 are the heating curves obtained from four different commercial clinkers. The compositions of these clinkers are given in Table 4. These samples are probably fairly representative of the clinkers produced today. In clinker A melting begins at 1,300 deg. C., in B and C melting starts at 1,290 deg. C., and in D at 1,298 deg. C.

TABLE 4.—*Compositions of the four commercial portland cement clinkers*

	Analyses							
Sample	CaO	Al_2O_3	Fe_2O_3	MgO	SiO_2	Ignition loss	SO_3	Na_2O and K_2O by difference
A	66.0	4.9	4.6	0.8	21.9	1.4	—	0.4
B	63.0	6.3	4.4	3.4	21.9	—	0.3	.7
C	64.7	7.5	2.9	4.2	20.4	.4	.3	—
D	64.7	5.9	4.1	1.8	22.4	.1	.6	.4

	Compound composition					
Sample	$3CaO.SiO_2$	$3CaO.Al_2O_3$	$2CaO.SiO_2$	MgO	$4CaO.Al_2O_3.Fe_2O_3$	$CaSO_4$
A	63	5	15	0.8	14	—
B	40	9	33	3.4	13	0.5
C	53	15	18	4.2	9	.5
D	46	9	30	1.8	12	1.0

The calculated compound compositions of these clinkers neglect everything except the CaO, Al_2O_3, Fe_2O_3, MgO, SiO_2, and SO_3.

Dyckerhoff gives a heating curve obtained from a

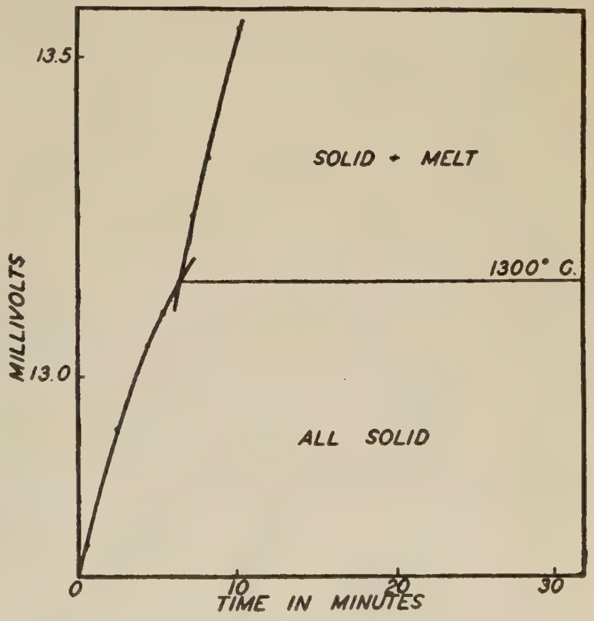


Figure 14. *Heating curve diagram from a commercial portland cement clinker A*

German clinker produced from commercial raw materials in which the first break appears at 1,285 deg. C.

Some portland cement clinkers contain very minor amounts of other components which may lower their initial melting temperature somewhat. It is therefore not possible to draw the general conclusion that all commercial portland cement clinkers will behave as these do.

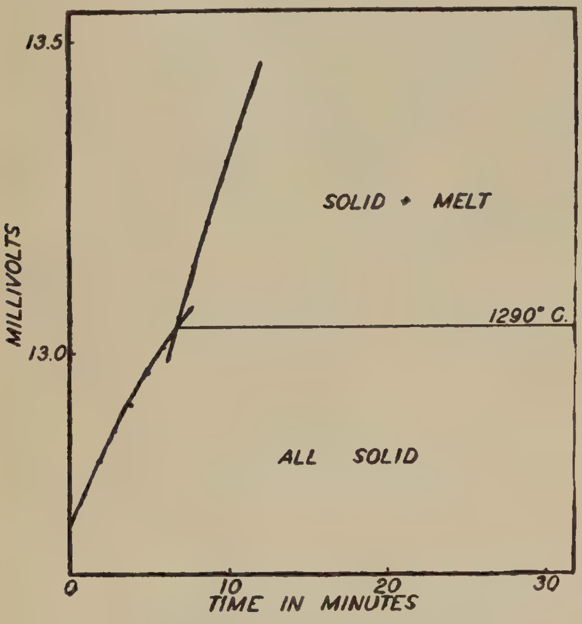


Figure 15. Heating curve diagram from a commercial portland cement clinker B

However, the liquid formation in most commercial clinkers probably is not appreciable at much below 1,290 deg. C.

There may be a certain amount of liquid formed in portland cement clinkers which is not in equilibrium with the final reaction products. For example, all mixtures of $3CaO.SiO_2$, $2CaO.SiO_2$, and $3CaO.Al_2O_3$ start to melt at 1,455 deg. C.; and all mixtures of $2CaO.SiO_3$, $3CaO.Al_2O_3$, and $5CaO.3Al_2O_3$ begin to melt at 1,335 deg. C. Samples 1 and 2, Table 2, after first heating might contain some $5CaO.3Al_2O_3$ as well as $3CaO.Al_2O_3$, $2CaO.SiO_2$, and CaO. When the temperature of such a mixture reached 1,335 deg. C. the eutectic mixture of $5CaO.3Al_2O_3$, $3CaO.Al_2O_3$, and $2CaO.SiO_2$ would melt. This liquid is not in equilibrium with CaO and would react immediately with CaO to form $3CaO.Al_2O_3$ and $3CaO.SiO_2$. If such a sample were removed from the furnace at this temperature the material would appear as a partially clinkered mass. If this clinker were ground and reheated to 1,350 deg. C., and removed from the furnace at this temperature, it would not be clinkered.

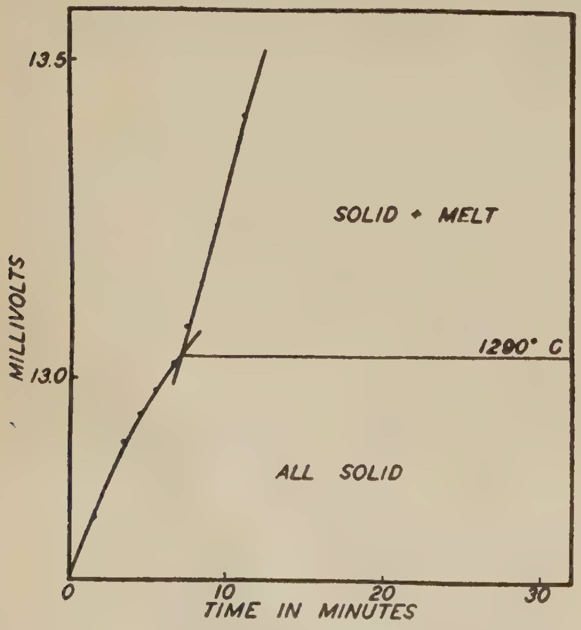


Figure 16. Heating curve diagram from a commercial portland cement clinker C

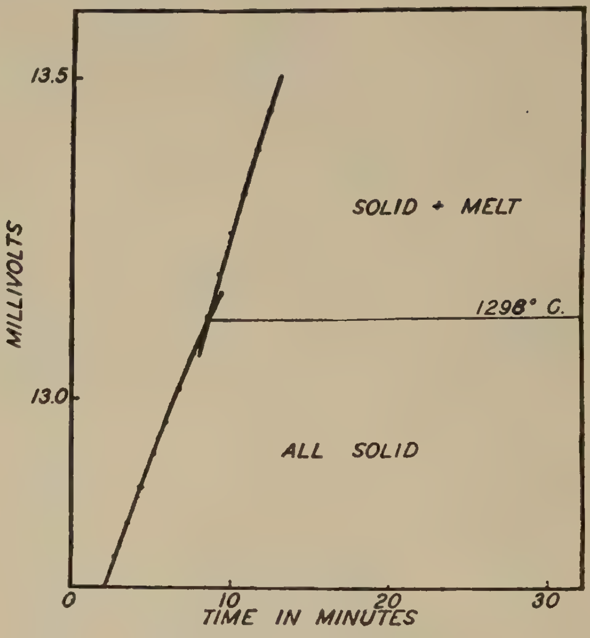


Figure 17. Heating curve diagram from a commercial portland cement clinker D

Similar melting may take place in the more complex portland cement mixtures, so that a certain amount of clinkering may be effected in practice at a temperature below that at which the liquid in equilibrium with the final reaction products is formed. Such melting would not take place if the raw mixture were sufficiently fine and uniform and if the rate of heating did not exceed that required to keep the mixture at equilibrium at all times. This study, therefore, does not show definitely the temperatures at which clinkering of these mixtures might start, unless the above ideal conditions are maintained.

It may be stated that in this paper only the temperatures of liquid formation are considered. The amount of liquid present at any given temperature, its viscosity and other properties, will vary with the composition and may exert a significant influence on rate of reaction in the kiln. The final results are summarized in Table 5.

TABLE 5.—*Table showing the temperatures at which melting starts when Al_2O_3, Fe_2O_3, MgO, and Na_2O are added to mixtures of CaO and SiO_2 in the proportions found in portland cement*

Systems	Compositions studied	Temperatures at which melting starts Deg. C.
CaO, SiO_2	Rankin and Wright Am. J. Sci., 39, p. 1, 1915.	2,065
CaO, SiO_2, Al_2O_3	Samples 1 and 2	1,455
CaO, SiO_2, Al_2O_3, Na_2O	Sample 9	1,430
CaO, SiO_2, Al_2O_3, MgO	Samples 3 and 4	1,375
CaO, SiO_2, Al_2O_3, Fe_2O_3	Samples 5 and 6	1,340
CaO, SiO_2, Al_2O_3, Na_2O, MgO	Sample 10	1,365
CaO, SiO_2, Al_2O_3, Na_2O, Fe_2O_3	Sample 11	1,315
CaO, SiO_2, Al_2O_3, MgO, Fe_2O_3	Samples 7 and 8	1,300
CaO, SiO_2, Al_2O_3, Na_2O, MgO, Fe_2O_3	Sample 12	1,280

Cement Statistics for May

Increases Ranging From Less Than One to Seven Per Cent Shown in All Departments—Total of 166 Plants Now Reporting

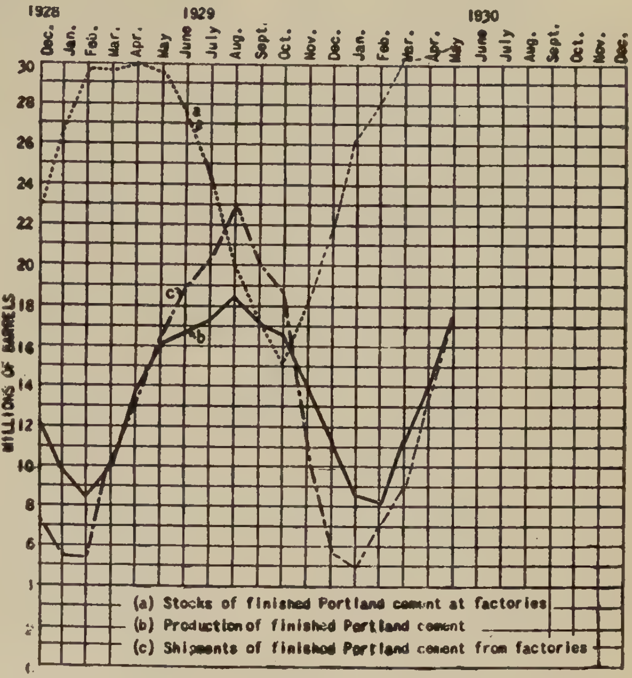
Relation of Production to Capacity

(Figures represent per cent)

	May 1929	May 1930	April 1930	March 1930	Feb. 1930
The month	76.4	**78.9**	64.0	51.5	41.5
The 12 months ended	**70.2**	66.2	66.0	66.1	65.6

	1929	1930	Increase or Decrease (—) Per Cent
Production, May	16,151,000	**17,271,000**	6.9
Shipments, May	16,706,000	**17,210,000**	3.0
Stocks at end of May	29,624,000	**30,928,000**	4.4
Total production for year to date	58,237,000	**58,677,000**	.8
Total shipments for year to date	51,299,000	**51,343,000**	.09
No. of plants reporting	161	**166**	3

NOTE: IN ORDER THAT THE READER MAY KNOW THE TREND AT A GLANCE, THE HIGHER FIGURE, WHETHER FOR EITHER YEAR, UNDER ANY CLASSIFICATION, APPEARS IN SLIGHTLY HEAVIER TYPE.



Production, Shipments, and Stocks of Finished Portland Cement, by Months, in 1929 and 1930

Month	1929—Production	—1930	1929—Shipments	—1930	Stocks at end of month 1929	Stocks at end of month 1930
January	**9,881,000**	8,498,000	**5,707,000**	4,955,000	26,797,000	**27,081,000**
February	**8,522,000**	8,162,000	5,448,000	**7,012,000**	**29,870,000**	*28,249,000
March	9,969,000	**11,225,000**	**10,113,000**	*8,826,000	29,724,000	***30,648,000**
April	**13,750,000**	13,521,000	13,325,000	***13,340,000**	30,151,000	***30,867,000**
May	16,151,000	**17,271,000**	16,706,000	**17,210,000**	29,624,000	**30,928,000**
June	16,803,000	....	18,949,000	....	27,505,000	....
July	17,315,000	....	20,319,000	....	24,525,000	....
August	18,585,000	....	23,052,000	....	20,056,000	....
September	17,223,000	....	19,950,000	....	17,325,000	....
October	16,731,000	....	18,695,000	....	15,381,000	....
November	14,053,000	....	11,222,000	....	18,213,000	....
December	11,215,000	....	5,951,000	....	23,550,000	....
	170,198,000	....	169,437,000	....	....	....

Production, Shipments, and Stocks of Finished Portland Cement, by Districts, in May, 1929, and 1930, and Stocks in April, 1930

District	Production—May 1929	Production—May 1930	Shipments—May 1929	Shipments—May 1930	Stocks at end of month 1929	Stocks at end of month 1930	Stocks at end of April, 1930
Eastern Pa., N. J. and Md.	3,541,000	**3,707,000**	**3,967,000**	3,746,000	6,355,000	**6,998,000**	7,037,000
New York	1,137,000	**1,176,000**	1,184,000	**1,191,000**	**2,195,000**	1,847,000	1,862,000
Ohio, Western Pa., and W. Va.	1,595,000	**2,111,000**	1,660,000	**1,974,000**	3,711,000	**4,102,000**	3,965,000
Michigan	1,387,000	**1,419,000**	**1,322,000**	1,229,000	2,724,000	**2,785,000**	2,595,000
Wis., Ill., Ind. and Ky.	2,065,000	**2,143,000**	**2,356,000**	2,026,000	4,052,000	**4,808,000**	4,691,000
Va., Tenn., Ala., Ga., Fla. and La.	1,276,000	**1,306,000**	**1,301,000**	1,192,000	**2,117,000**	1,865,000	1,751,000
Eastern Mo., Ia., Minn. and S. Dak.	1,548,000	**1,763,000**	1,649,000	**2,184,000**	**4,261,000**	3,628,000	4,049,000
W. Mo., Nebr., Kan., Okla. and Ark.	1,117,000	**1,360,000**	1,007,000	**1,390,000**	1,527,000	**1,807,000**	1,837,000
Texas	**655,000**	630,000	563,000	**620,000**	535,000	**836,000**	825,000
Colo., Mont., Utah, Wyo. and Idaho	**363,000**	325,000	**334,000**	283,000	521,000	**582,000**	540,000
California	**1,142,000**	938,000	**1,066,000**	973,000	997,000	**1,095,000**	1,130,000
Oregon and Washington	325,000	**393,000**	297,000	**402,000**	**629,000**	575,000	585,000
	16,151,000	**17,271,000**	16,706,000	**17,210,000**	29,624,000	**30,928,000**	30,867,000

*Revised.

MEN and MILLS

Notes from the Field

Varied Program at Crescent Safety Rally

A mass safety rally consisting of all employees of the Crescent Portland Cement Co., numbering about 250, in addition to guests, was held at the community hall at Wampum, Pa., on May 16th. The gathering was a get-together meeting to promote plant and community interest in safety movements.

All participants in the program were either employees of the company or other local persons, with the exception of the principal speaker, Robert G. Forbes, safety director of the National Tube Co., Ellwood City, Pa.

W. M. Powell, safety director of all plants of the Medusa Co. was master of ceremonies. R. B. McHenry, engineer, made a brief humorous talk. W. P. Rise, superintendent of the Crescent plant, closed the speaking program, which was augmented by an orchestra.

Moving pictures of scenes at the Crescent; Silica, Ohio; Dixon, Ill.; and Manitowoc, Wis., plants were an added diversion.

Peerless Stockholders and Directors Elect Leaders

Stockholders of the Peerless Cement Corporation in annual meeting in Detroit on May 13th re-elected the following directors: L. A. Beeghly, Youngstown, Ohio; E. A. Peck, Chicago; William M. Hatch and S. R. Livingstone, both of Detroit; Charles Schmutz, Youngstown, Ohio; R. D. Baker, Detroit; and R. T. McKenna, Washington, D. C. Fred H. Mason, Chicago, was named to succeed A. J. Henning, also of Chicago.

The directors elected L. A. Beeghly, chairman of the board; William M. Hatch, president; Charles Schmutz, vice-president; S. R. Livingstone, secretary; J. C. Baker, treasurer; and M. E. Mills, assistant treasurer.

Arkansas Students Visit Okay Plant

For the purpose of obtaining information of some of the industrial developments and plants in Arkansas, twenty-three members of the junior class, College of Engineering, University of Arkansas, visited the cement plant of the Arkansas Portland Cement Company at Okay, Ark., Monday, June 2nd, as guests of the officials. The party arrived at the plant early in the morning, and after being shown through the plant the members were served luncheon at the club house there.

P. C. Blaise New General "Super" of Missouri Portland Plants

P. Carus Blaise has been appointed general superintendent of the plants of the Missouri Portland Cement Company. His headquarters are at St. Louis.

Mr. Blaise was previously superintendent of the Missouri plant at Kansas City. Now 31, he is said to be one of the youngest general superintendents of cement plants in the United States. He has supervised the construction of plants at Lima, Peru and LaPaz, Bolivia. He is a chemical and structural engineer.

Steventon New International Purchasing Agent

C. P. Steventon, formerly purchasing agent of the Lone Star Cement Company at Bonner Springs, Kansas, has been transferred to the New York City headquarters of the International Cement Corporation. Mr. Steventon will be purchasing agent for the 13 plants of the company.

Dibble New Superintendent of Aetna Plants

Oliver A. Dibble, for 15 years chief chemist of the Aetna Portland Cement Company plants, was recently appointed general superintendent of both of the company's plants, located at Fenton and Bay City, Mich.

Mr. Dibble has been closely associated with plant operation since joining the company.

Buelow Southwestern Representative

C. Buelow has replaced W. S. Nugent, as salesman for the Southwestern Portland Cement Company in the Detroit territory.

New Universal Atlas Offices

The New York offices of the Universal Atlas Company has been combined and are now located in the Chrysler building, 42nd St. and Lexington Ave.

Longstreth Medal for E. G. Bailey

At the Medal Day exercises held on May 21st in the hall of the Franklin Institute at Philadelphia, Pa., Ervin G. Bailey, president of the Bailey Meter Company, Cleveland, Ohio, was awarded the Edward Longstreth medal by the institute.

Mr. Bailey received the medal upon the recommendation of the institute's committee on science and arts in recognition of his inventions and developments of regulating and controlling devices, and of measuring and recording instruments.

Mr. Bailey, who was graduated in mechanical engineering from Ohio State University class of 1903, holds many patents on instruments and equipment used in the combustion field. He is president of the Fuller Lehigh Company at Fullerton, Pa., and a director of the Babcock & Wilcox Company of New York.

Dick Hardy Wins P. C. A. Administration Cup in Spring Tourney

Richard Hardy won low gross honors in the Fifth Annual Spring Golf Tournament of the Portland Cement Association held at the Woodridge Golf club near Lisle, Ill., on Sunday, June 8. His score was 90 for the 18 holes.

W. D. M. Allan, first winner of the Administration Cup, was runner-up to Hardy for low gross honor, with a score of 96.

Lone Star, Medusa, Trinity Delegates to Trophy Meeting

As is customary, plants winning the Portland Cement Association safety trophy for the past year were each represented at the recent presentation ceremonies in New York City. The formal awarding of the trophies for 1929 took place during the association's annual meeting there on May 26th to May 28th.

Following are a few of the delegates and the plants they represented: W. R. Foster, labor foreman, and J. F. Lowry, shipping clerk, Lone Star Cement Co., Louisiana; J. K. Schoenegge, general mill foreman, and B. F. Hobbins, assistant superintendent, Toledo plant of Medusa; and Henry F. Lamb, general mill foreman, and C. A. Sutherland, machine shop foreman, Trinity plant at Dallas, Texas.

Six Pennsylvania Plants Inaugurate Campaign With Big Meeting

On May 22nd the Nazareth division of the Lehigh Valley Safety Council held the largest meeting in its history, with approximately 1000 people present. The attendance represented a large majority of all the employees of all cement companies in and around the borough of Nazareth, together with the Bates Valve Bag Company.

The following organizations sponsored the meeting and attended in large numbers: Hercules Cement Corporation, Nazareth Cement Company, Lone Star Cement Company, Keystone Cement Company, Penn-Dixie Cement Corporation, Plants 4 and 6, Bates Valve Bag Company, Nazareth Public Schools, Chamber of Commerce and the Rotary club. The purpose of the meeting was to draw all organizations that are members of the National Safety Council into a semi-annual meeting, and to start off with a 5-month no-accident campaign in which the above plants will compete for silver plaque trophies which will be awarded at the conclusion of the campaign. The Cement Choral Club sang a number of selections.

Fred B. Hunt, electrical engineer of the Nazareth Cement Company, acted as chairman of the meeting. He introduced R. B. Fortuin, assistant to the general manager of the Penn-Dixie Cement Corp., who outlined the purpose of the meeting and the procedure in the coming 5-month no-accident campaign. Mr. Fortuin stated that in 1927 the plants now in this campaign experienced twenty lost-time accidents. The following year the first campaign resulted in but three lost-time accidents among all the competing plants. Three lost-time accidents were reported for the same period in 1929. This year holds excellent prospects of five months without a single lost-time accident.

The chairman then introduced M. P. Grady, foreman of the Canton, Ohio, shops of the Pennsylvania Railroad. Mr. Grady is a speaker with wide experience and the key-note of his talk was that a man, to be an efficient employee and one who is a safe employee to himself and his fellow-workers, requires three assets. They are personality, poise and tact. Following Mr. Grady's talk the meeting was brought to a close with the showing of a popular moving picture.

Three Hundred Attend Lehigh Safety Program

More than 300 persons attended the safety program and dancing party held Saturday evening, May 31st, at the music hall in Oglesby, sponsored by the Lehigh Portland Cement mill.

J. J. Bassett, mechanical engineer for the company, was general chairman of the arrangements and also acted as master of ceremonies. John Young, superintendent of the mill, supervised the affair.

Song and dance numbers were a feature of the evening's program and a local pastor talked on "Safety."

Community singing was also a feature of the party and Victor Lundberg was in charge. Refreshments were served late in the evening.

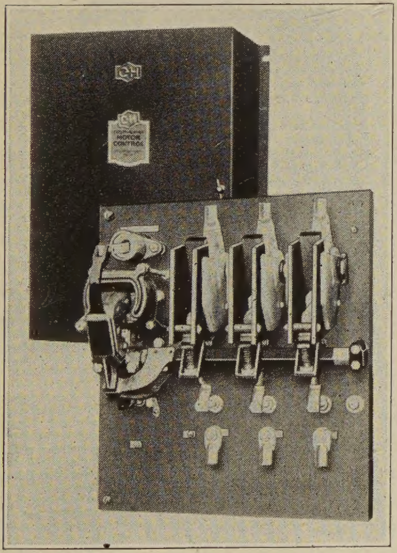
Cement Institute Manager Visits Plants

George H. Reiter, manager of the Chicago division of the Cement Institute, visited cement plants in Indiana and Ohio during the middle of June.

Mill Equipment

Two New Heavy Duty A. C. Contactors

Two new magnetic contactors, for heavy duty A. C. service, are announced by Cutler-Hammer, Inc., Milwaukee, Wis. They are rated for maximum capacities of 300 and 600 amperes respectively.



Features of these new contactors make them generally applicable to all heavy duty requirements, it is stated. They are arranged for either two or three wire control, have continuous duty operating coils, efficient magnet structure and exceptionally heavy, butt type, solid copper contacts, according to the manufacturer. An air cushion absorbs the shock of the magnet on closing, to reduce wear and make the contactor operate more quietly. For general use, the 300 ampere contactor is mounted in a wall type enclosure, and the 600 ampere size is in a floor type case.

Link-Belt Announces New Pillow Block

Link-Belt Company are just announcing their Timken anti-friction ball and socket pillow block. Designed several years ago, it has been improved, perfected and service-proved in the meantime.

These pillow blocks are designed to fit any good grade of commercial shafting, from 1 7/16 in. diameter to the largest size, without special fittings or the use of appliances.

Because these pillow blocks use pressure lubrication, they are said to be practically dust-tight. The grease is forced in at the center and out at the shaft openings. Thus, with the addition of the grease seal at the top, dust and grit are kept out of the bearing.

"Rol-Man" Fine-Mesh Manganese-Steel Screens Announced

Of interest to users of screens for grading fine, abrasive materials is the announcement by the Manganese Steel Forge Company, Philadelphia, Pa., of the development of fine-mesh screen cloth made of drawn manganese-steel wire.

The new screen cloth is manufactured of "Rol-man," a true manganese steel with an ultimate tensile strength of 140,000 to 160,000 lbs. per sq. in., a shearing strength of 100,000 to 110,000 lbs. per sq. in., and an elongation of 35 to 50 per cent in 2 in., according to the manufacturer. These physical properties are said to give it unusual wear-resisting qualities and extreme toughness and strength.

The new cloth does not become flabby, and "dead spots" do not develop, it is said.

"Rol-Man" fine-mesh screen cloth is available in sizes from 2-mesh down to 16-mesh, with square or rectangular openings, and in desired wire diameters. It can be furnished in rolls 50 feet and longer, and 24, 36, 48 or 52 in. wide, or can be cut to order in practically any specified widths and lengths.

Link-Belt Presents Promal, New Metal for Chains

A new line of cast chains for which the manufacturer claims remarkable strength and durability in comparison with malleable chains has been placed on the market by Link-Belt Company, Indianapolis. These chains are sold under the registered trade name of "Promal."

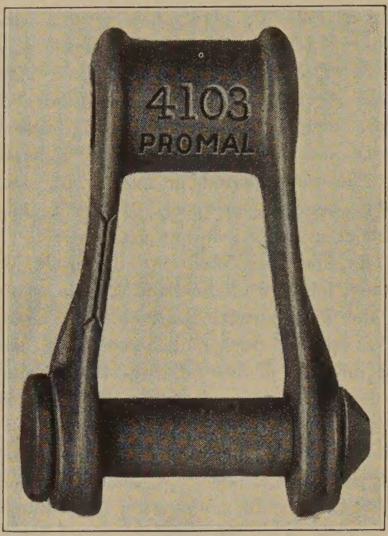
They are the result of extended research to provide longer life for drive and conveyor chains operating under heavy loads or abrasive conditions. Experimentation with cast chain metals, started about four years ago, led to the discovery of a new method of processing malleable iron which so altered its physical characteristics as to make it a distinctly new metal, it is stated.

The average physical characteristics of Promal are compared in the following tabulation with malleable iron and with mild cast steel:

	Promal	Malleable iron	Mild cast steel
Yield point, lb. per sq. in.	45,000	36,000	34,000
Ultimate strength, lb. per sq. in.	65,000	54,000	60,000
Elongation, per cent	14	18	26

Promal thus has, to a high degree, according to the manufacturer, the quality desirable in sprocket chain material—great toughness to resist extreme tension without permanent stretch; high strength in proportion to weight and size; and hardness that affords great resistance to abrasive wear.

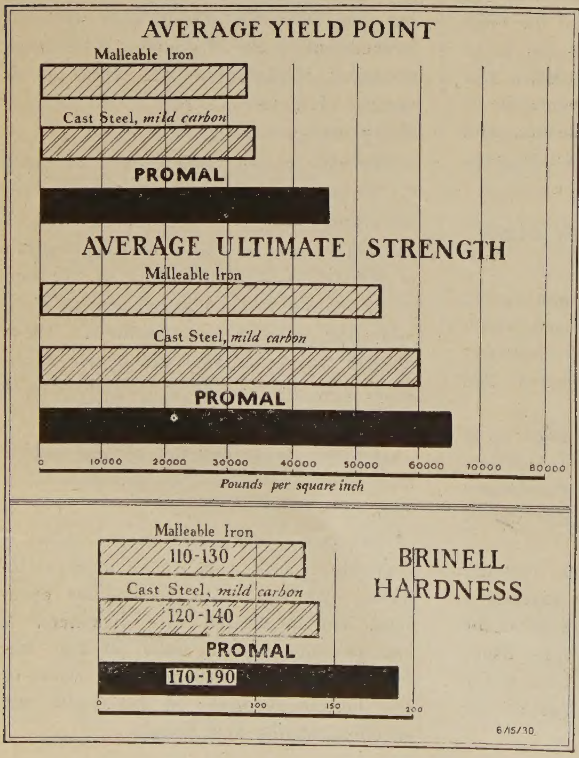
Although laboratory tests indicated the better wearing qualities of Promal chains when they were first developed, they were withheld from the open market for more than three years, to permit extensive field tests. For these tests, many chains were tried out in various industries through the co-operation of Link-Belt customers. A check was then kept on the performance of Promal chains while subjected to every-day usage. The results have uniformly substantiated the laboratory tests, it is stated.



An example cited is that of a Promal chain in a Pennsylvania cement mill, running night and day in an atmosphere saturated with cement dust, which has already lasted more than twice as long as the malleable chain used before, and shows no evidence of serious wear.

In an Ohio plant a Promal chain driving a tumbling barrel has lasted six times as long as the malleable chain it replaced, and it is still in operation. This particular drive affords a hard test because of the short center distance of 4 ft. between sprocket shafts, the large ratio of reduction (from a 13-tooth driving sprocket to a 78-tooth driven wheel) and an irregular, jerky load.

Promal chains are particularly recommended for four general classes of service: (1) Chain drives, elevators and conveyors operating under gritty or abrasive conditions; (2) chain drives where greater strength is required than the corresponding size of malleable iron chain provides; (3) drag, scraper and flight conveyors where the chain drags and is subject to abrasion; and (4) heavy duty drives of comparatively high speed, short centers and large sprocket ratios.



New Plymouth Gas Electric and Oil Electric Locomotives

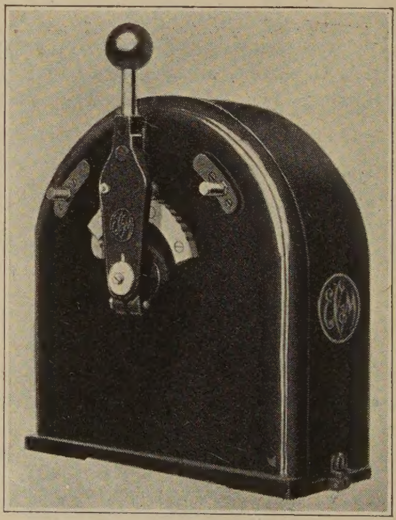
The Fate-Root-Heath Co. (Plymouth Locomotives Works), Plymouth, Ohio, have brought out a new line of gas electric and oil electric locomotives in a full range of sizes from 25 to 60 tons.

This model is 31 ft. 4 in. long, and 9 ft. wide. The frame is built of 15 in. I beams and 9 in. girder beams, rigidly constructed, with cast steel bumpers and bolsters. Two 4-wheel, spring-equalized trucks permit the locomotive to negotiate sharp curves and ride rough track with ease.

It is equipped with two 6-cylinder engines, one in each end of locomotive, developing 350 h.p. at 1,000 r.p.m.; Westinghouse electrical equipment including two 105 k.w. 500 volt d.c. generators mounted on base with engines; and four 110 h.p. motors, two mounted on each truck.

New Thermostat to Control Industrial Heating Units

The General Electric Company announces the CR-2992-A-1 thermostat for use with industrial heating units where very close control of the heat is not required. The new device is available in three principal ratings, and the operating ranges are (1) 60 to 200 deg. F.; (2) 150 to 300 deg. F., and (3) 250 to 400 deg. F.



The current-carrying capacity is 15 amperes at 115 or 230 volt alternating current, or ¼ ampere at the same voltages direct current. The thermostat will operate with a differential of 5 per cent of the maximum temperature range, according to the manufacturer.

The unit is mounted on a pressed-steel base which has two mounting holes and an upturned ear with an opening for a ¾-in. conduit.

With the Manufacturers

Industrial Literature

Comprehensive Boiler-Feed Bulletin

A new bulletin, *No.* 361, just published by the *Griscom-Russell Company,* New York City, discusses in a complete way the functions, applications and advantages of evaporators for distilling boiler-feed make-up water. One of the topics of interest is the recently developed "reducing valve evaporator system" to permit the economical application of evaporators to industrial plants. This system, which is said to have been originated by the Griscom-Russell Co. and fully explained for the first time, provides process steam and boiler feed make-up at one operation.

The bulletin further discusses in detail the history of evaporators, the benefits of distilled boiler-feed and the different types of evaporator systems that have been found most advantageous for various operating conditions.

A Heat Benefit Analysis in tabular form gives definite data on possible savings.

Material Handling Conveyor Catalog

A new catalog, *No.* 202, on *"Bulk Material Handling Conveyors"* has just been published by the *Chain Belt Company* of Milwaukee, Wis. This book gives engineering data and illustrations on Rex bucket elevators of all types, super-capacity elevators, bin gates, track hoppers and feeders, steel apron and pan conveyors, weigh larries and screw conveyors.

Lubrication Monthly

Interesting items of a varied nature appear in the May issue of the monthly publication *"Alemite Industrial Lubrication"* of the *Alemite Corporation,* Chicago, Ill.

The leading article is entitled "For Bearings Hard to Reach—For Bearings Requiring Constant Lubrication."

Links and Sprocket Wheels

Crawler equipment is the subject of a new four-page folder published by the *American Manganese Steel Company,* Chicago Heights, Ill. Descriptions and a price list are given.

Driller Publication

A number of items of interest are found in the May issue of *"The Armstrong Driller,"* a publication of the *Armstrong Manufacturing Company,* Waterloo, Ia.

The wide variety of subject matter concerns chiefly, of course, drill installations and performances.

"Link-Belt News"

The leading article in *"Link-Belt News"* for May is the reprinted address of President Alfred Kauffman entitled, *"Some Trends in Industry."* This was originally given in 1929 before the annual convention of the National Association of Foremen.

Other pages show and describe a variety of equipment units.

G-E Control Catalog

The General Electric Company, Schenectady, N. Y., has just published its industrial *Control Catalog GEA-606B* for 1930. This 200-page book furnishes information on representative lines of industrial control and includes instructive matter on the care and operation of control devices.

Gyratory Crusher Description

The Superior McCully Fine Reduction Gyratory crusher for secondary crushing is described in a new publication, *Bulletin* 1461-B, issued by the *Allis-Chalmers Mfg. Co.,* Milwaukee, Wis.

Du Pont Publications

Extensive information concerning the characteristics of modern permissibles and the methods of using them to the best advantage is contained in a new and profusely illustrated pamphlet entitled *"Permissible Explosives"* and published by the *E. I. du Pont de Nemours & Company, Inc.,* Wilmington, Delaware.

The book opens with an explanation of how a permissible explosive becomes a permissible, including a brief description of the tests which such an explosive is required to pass at the United States Bureau of Mines. The next two sections deal with the data in the Bureau of Mines List of Permissible Explosives and the conditions laid down by the Bureau for the use of permissibles.

NOTES FROM THE FIELD

Edge Moor Sales Manager

The Edge Moor Iron Company, Edge Moor, Delaware, has announced the appointment of *Harry L. Moody* as general sales manager of the company, commencing June 1st. Mr. Moody will be located at the main office at Edge Moor.

Mr. Moody joined the sales department of the Westinghouse Machine Company in 1909, being located at the Boston office. Following the consolidation of the Westinghouse Machine Company with the Westinghouse Electric & Manufacturing Company he was transferred to their Philadelphia office as manager of the power division and later appointed sales manager of the Central Station division, in which capacity he was responsible for the company's activities with public utilities located in the Philadelphia district.

In 1923 he became sales manager of the U. G. I. Contracting Company of Philadelphia, having charge of the development of new business activities along engineering and construction lines with the exception of gas construction work.

Link-Belt Expansion

Link-Belt Company, Crane and Shovel Division, Chicago, announce the substantial enlargement of their sales organization, so as to be better able to cope with the increasing demand for shovels, cranes and draglines.

This includes the recent appointment of the following companies as their direct representatives for the sale of these machines: *W-D-M Equipment Company,* Box 329, Columbia, South Carolina; *Myer & Cunningham,* 30 Church St., New York City, N. Y.; *Barzee Equipment Company,* 1223 Burnet Avenue, Syracuse, N. Y.; *S. G. Hawkins Company,* 723 Washington Avenue, Houston, Texas; *Lewis-Patten Company,* San Antonio, Texas; *West Virginia-Kentucky Hardware & Supply Company,* Huntington, W. Va.

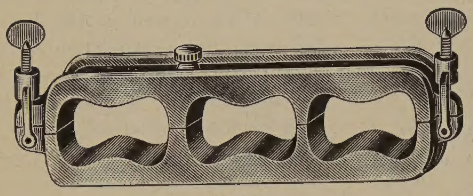
Chemical Sales and Service Convention

The Roessler and Hasslacher Chemical Co., New York, N. Y., held its annual sales and service convention at Niagara Falls on June 9th to 11th. In attendance were executives from the company's manufacturing plants and New York offices, district sales managers, sales and service men from various branches in the United States, Canada and Mexico. The convention was presided over by Dr. H. R. Carveth, president of the company.

Western Precipitation Moves

The Western Precipitation Co., manufacturer of systems of dust collection by electric precipitation, has moved its New York office from 25 West 43rd Street to the new Chrysler Building, 405 Lexington Avenue. *P. E. Landolt* is eastern manager in charge of the New York office territory.

Laboratory Apparatus for Cement Testing



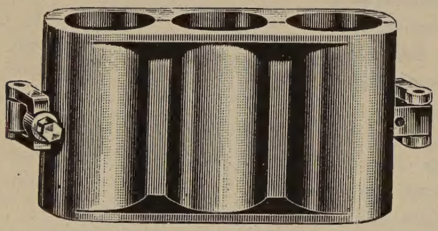
2406

Laboratory Tests for tensile strength and compressive strength of Portland Cement should be performed according to Standard A. S. T. M. Specifications. A very necessary requisite for these tests are molds according to A. S. T. M. design.

2404 BRIQUETTE MOLD—Single, of brass with end clamps for forming test pieces for tension tests. According to the dimensions specified in A. S. T. M. Test C 9-26 .... **4.20**

2406 BRIQUETTE GANG MOLDS—A. S. T. M., of brass with end clamps.

No. of briquettes	2	3	4	5	6
Each	**7.00**	**10.50**	**14.00**	**17.50**	**21.00**



2423

2422 CYLINDRICAL MOLD—Brass, for preparing cylinders used in determining the compressive strength of Portland Cement Mortars. Diameter, 2 inches; height, 4 inches. According to the dimensions specified in A. S. T. M. Tentative Test C9-16T.......... **3.25**

2423 CYLINDRICAL MOLD—Triple, for preparing three cylindrical test pieces at one time. Diameter of each cylinder, 2 inches; height 4 inches.......... **16.00**

These molds are carried in stock for immediate delivery

For a complete listing of Cement Testing Apparatus and Chemical Laboratory Apparatus refer to Catalog C. Write for a copy if you do not have one.

THE CHEMICAL RUBBER CO.

Laboratory Apparatus and Chemicals

West 112th Street and Locust Avenue
Cleveland, Ohio

Promoter of Famous British Cement Combine Bankrupt

Under the compulsory liquidation of the Associated Anglo-Atlantic Corporation, Ltd., London, one of the Horne cement group, a meeting of the shareholders and creditors was recently held in London. G. Digby Pepys, senior official receiver, presided.

This undertaking was promoted in October, 1923, by Henry Spence Horne with a capital of £1,000,000 to carry on a general finance business. The company has been concerned in the promotion and amalgamation of a number of cement companies now known as the Red Triangle Group. Later the company was concerned in the promotion of British Cement Products & Finance Co., Ltd. The accounts filed under the liquidation show the total liabilities as £1,105,509 ($5,527,545), of which £704,528 ($3,522,640) is expected to rank for dividend against assets of £4,259 ($21,295). The deficiency with regard to contributories is estimated at £1,752,753, ($8,763,765). Dividends of 10 per cent were paid on both ordinary and deferred shares in 1927, absorbing £80,000 ($400,000), and in the following two years the ordinary shareholders received a dividend of 15 per cent and the deferred shareholders 5 per cent, absorbing £190,000 ($950,000).

The failure is attributed to serious depreciation in assets which consisted of shares in cement and newspaper companies, the depreciation being accentuated by loss of credit to the company and its associated companies of the Red Triangle Group due to the bankruptcy of its chairman, H. S. Horne.

Push Work on Arkansas Filter Installation

Work is being pushed as much as possible on the construction of the filter installation at the Arkansas Portland Cement Company plant at Okay, Ark.

According to Superintendent J. F. Kaufman, demand has been so heavy that cement has been distributed as quickly as produced and none placed in storage.

Hydraulic Cements Other Than Portland

A production of 2,209,465 barrels of hydraulic cements other than portland, including masonry, natural and puzzolan cements, in 1929 is reported by the Bureau of Mines. This is a reduction of 0.04 per cent as compared with 1928. Shipments aggregated 2,159,130 barrels, valued at $2,950,717.

Shortage of Limestone Forces Gold Hill Plant to Stop Work for Month

Due to a shortage of limestone caused by a slide of overburden at the Beaver Portland Cement Company's Marble mountain quarry at Gold Hill, Oregon, the local plant was closed down late in May for about a month. Annual repairs were made during the enforced suspension.

Luxembourg Cement Mill Profits Increase

The cement firm Societe des Ciments Luxembourgeois, Luxembourg, reports net profits of 1,229,473 francs for the past year as compared with profits of 984,188 francs the preceding year.